City of Shoreline

Annual Traffic Report

2016

Table of Contents

Introduction 4
Executive Summary 5
Data Sources 6
Definitions 6
Collision Summary 8
Regional Comparison 9
Societal Costs 10
Contributing Circumstances 12
Injury Collisions 18
Injury Collision Regional Comparison 22
Pedestrian and Bicycle Collisions 24
High Collision Locations 25
Collision Reduction Strategy 28
Target Zero 28
Location Specific Collision Reduction Strategy 31
2016 Implemented Improvements and Emphasis Areas 34
Public Works 34
Shoreline Police Department 34
Improvement Results 35
Traffic Speed Summary 39
Traffic Volume Summary 40
Transit Summary 41
Pedestrian and Bicycle Count Summary 42
Appendix 43
Appendix A – 2014-2016 Total Collisions Map 45
Appendix B – 2014-2016 Injury Collisions Map 46
Appendix C – 2012-2016 Nonmotorized Collisions Map 47
Appendix D – 2014-2016 Fatal and Serious Injury Collisions Map 48
Appendix E – 2016 Traffic Flow Map 49
Appendix F – 2016 Speed Differential Map 50

Introduction

This report provides an annual review and analysis of data collected by the City of Shoreline Traffic Services section. It summarizes collisions, speeds, transit ridership, pedestrian and bike data, and traffic volumes, highlighting noteworthy trends. The data in this report guides the City's prioritization of Traffic Services capital improvement project resources, identifies potential projects for the upcoming year's Transportation Improvement and Capital Improvement plans, supports pursuit of grant opportunities, and identifies target enforcement areas for the Shoreline Police Department.

This report strives to provide clear and usable traffic safety and operational information for reference by staff, Council and the citizens of Shoreline.

To request additional information, please contact the Public Works Department, Traffic Services section or visit the Traffic Services webpage at http://shorelinewa.gov/government/departments/public-works/traffic-services.

Executive Summary

Growth is evident in the Puget Sound Region and accordingly, Average Daily Traffic Volumes are up 1.7 percent, with peak hours up just over 2 percent as represented by 8 regular traffic data collection sites. Similarly, there has been a significant uptick in transit use with 7.5 percent more transit boarding's in 2016 compared to 2015.

2016 saw an increase in total and injury collisions in comparison to 2015. In the 2010 to 2016 monitoring period, this is the first year that marks an upward trend in overall collisions, however injury collisions continue to trend downward. Regional comparisons show a similar trend of both total and injury collisions. Pedestrian collisions have been declining over the last 3 years, however bicycle related collisions are on the rise, with the most collisions ever reported occurring last year.

Perhaps unsurprisingly, distracted driving, the most often cited contributing circumstance in Shoreline collisions, continues to rise. It is cited as a factor for 27% of collisions in Shoreline and 26% of collisions statewide. With more people walking and biking, it is more important than ever to educate drivers on the dangers of cell phone use while driving, and perform targeted emphasis patrols to ensure drivers on our streets know this is a priority for our City.

In 2016, alcohol and/or drug impaired related collisions saw a substantial spike; the highest in the 2010 to 2016 period and more than doubling the preceding 3 year average. Also notable is that these impaired driving collisions accounted for more than 16% of injury collisions, a significant increase in comparison to prior years; demonstrating the need for continued education and enforcement strategies on this topic.

Non-motorized safety continues to be a top priority as well. Pedestrian collisions are down slightly from 2015, however bicyclist collisions have risen making the total number of non-motorized collisions equal to 2015 numbers. Accounting for more than 30% of injury collisions, those involving the transportation system's most vulnerable users warrant attention. We know that speed is a major factor in whether a pedestrian or bicyclist survives a collision. For this reason, it is important to continue to focus on driver compliance with speed limits. Additionally, analysis of lighting conditions shows that pedestrian related collisions are represented at a significantly greater rate when it is dark, in comparison to the general collision rate. This emphasizes the need for adequate street lighting, especially at crossings where most pedestrian collisions occur.

Lastly, this year's report includes a summary of safety improvement results, including a short summary on the Aurora Corridor Project benefits. This section clearly demonstrates that the City's financial investment in safety improvements is making a difference, and confirms the importance of strategic, data driven improvements.

Data Sources

This report summarizes collision data trends based on data from 2010 through 2016, with emphasis on years 2014 through 2016. Only collisions that occurred on City streets and are investigated by police officers are included in this report. Excluded are collisions on private property, locations outside of the City of Shoreline (i.e. N 145th Street), phone reports, non-police investigated incidents, collisions under the threshold of $1000, and other non-collision vehicle incident reports.

Collision data is obtained from the Washington State Department of Transportation (WSDOT). Data from WSDOT includes collisions investigated by other agencies such as Washington State Patrol. No citizen reports are included as WSDOT stopped providing this data to local jurisdictions as of January 1, 2009. The data contained in this report is based on reportable collisions only, as defined in the following section.

Traffic volume and speed data presented in this report was collected and analyzed by Shoreline Traffic Services staff.

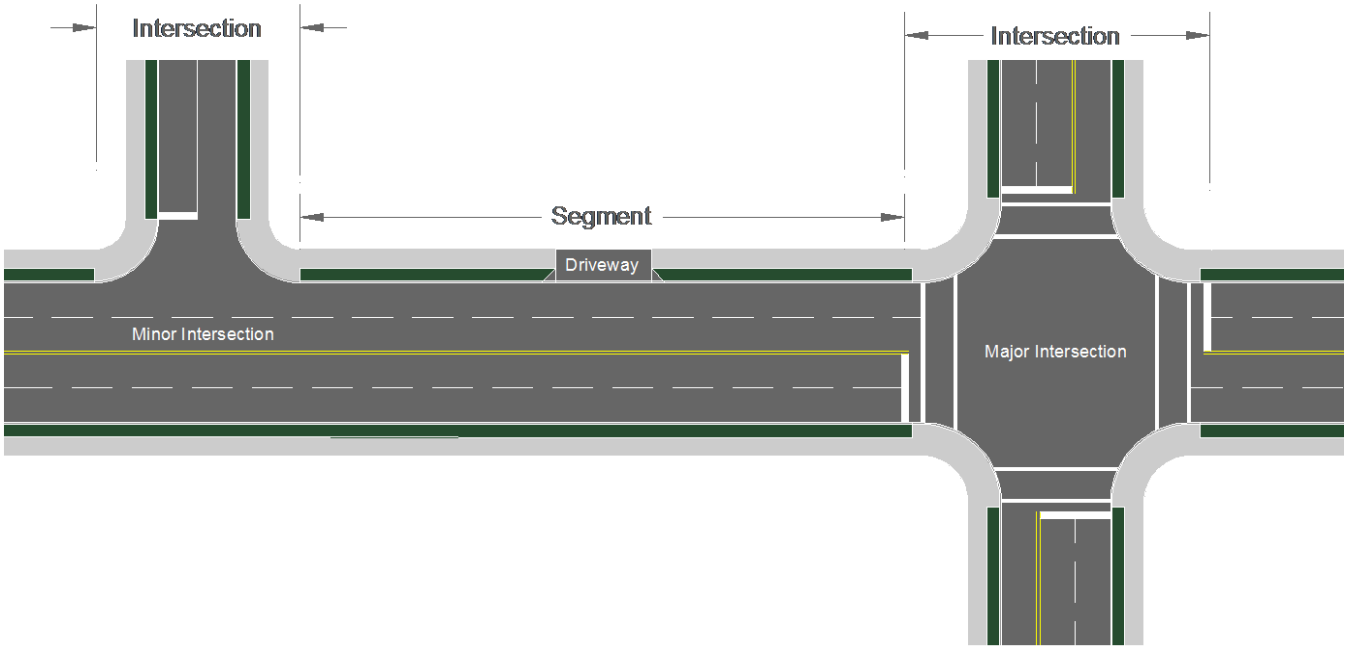
Transit data was provided by King County Metro and pedestrian and bicycle data is from WSDOT's Bicycle and Pedestrian Documentation Project.

Definitions

Reportable Collision	A collision which involves death, injury, or property damage in excess of $1000 to the property of any one person.
Fatal Collision	Motor vehicle collision that results in fatal injuries to one or more persons.
Serious Injury Collision	A motor vehicle collision resulting in an injury assessed by the investigating officer as "any injury which prevents the injured person from walking, driving, or continuing normal activities at the time of the collision."
Evident Injury Collision	A collision resulting in an injury assessed by the investigating officer as "any injury other than fatal or serious at the scene. Includes broken fingers or toes, abrasions, etc. Excludes limping, complaint of pain, nausea, momentary unconsciousness, etc."
Possible Injury Collision	A collision resulting in an injury assessed by the investigating officer as "any injury reported to the officer or claimed by the individual as momentary unconsciousness, claim of injuries not evident, limping, complaint of pain, nausea, hysteria, etc."
Property Damage Only Collision (PDO)	Motor vehicle collision in which there is no injury to any person, but only damage to a motor vehicle, or to other property, including injury to domestic animals.

Did Not Grant Right of Way	A contributing circumstance type which indicates that the driver failed to properly yield Right of Way; for example, a driver hitting a pedestrian in a crosswalk when the walk signal is on for the pedestrian movement.
High Collision Location	Locations with the highest number of reported collisions.
Collision Rate	For intersections, the number of collisions at an intersection divided by the average annual volume of vehicles entering the intersection. The resulting unit is collisions per million entering vehicles. For segments, the number of collisions along the segment divided by the length of the segment and the average annual volume of vehicles along the segment. The resulting unit is collisions per million vehicle miles.
85th Percentile Speed	The speed at which 85% of traffic is traveling at or below; a traffic engineering standard for measuring and evaluating traffic speeds.
Target Zero	Target zero is Washington State's Strategic Highway Safety Plan for zero fatal and serious injury collisions by the year 2030. See Collision Reduction Strategy section.

For High Collision Location analysis, intersections and segments are categorized as shown below.

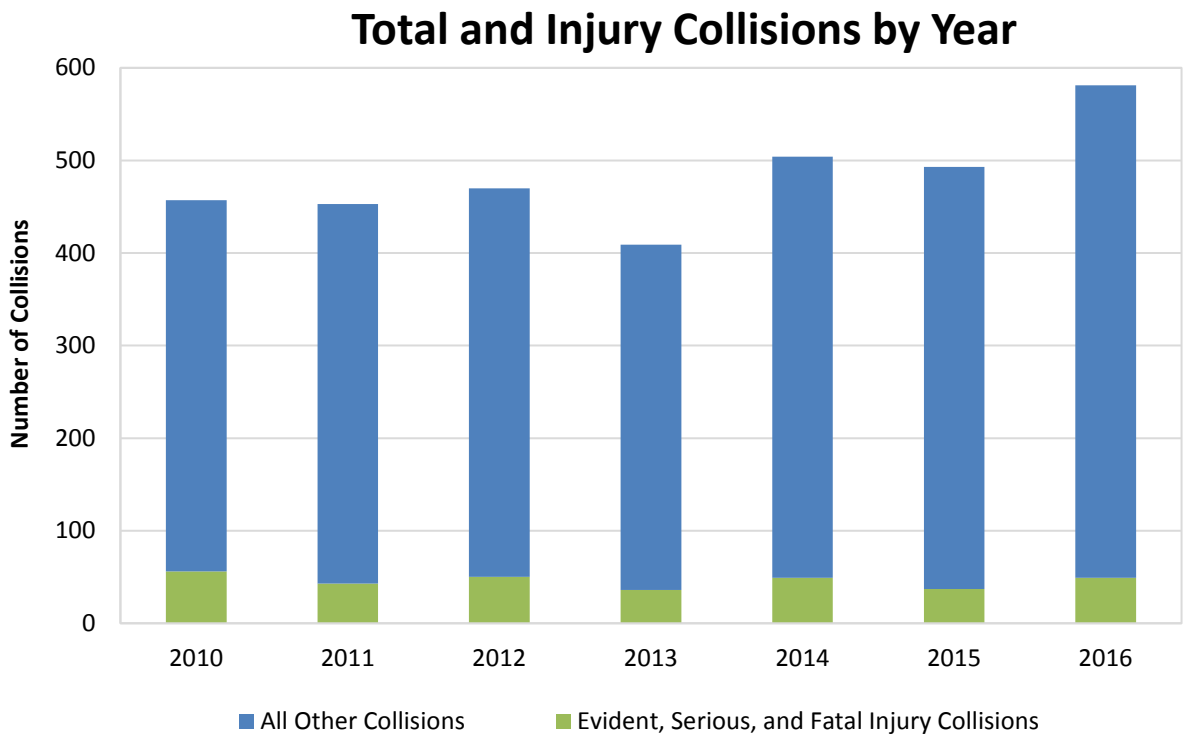


Collision Summary

There were 581 collisions reported on City of Shoreline streets in 2016. Below is a summary of collisions from 2010 through 2016.

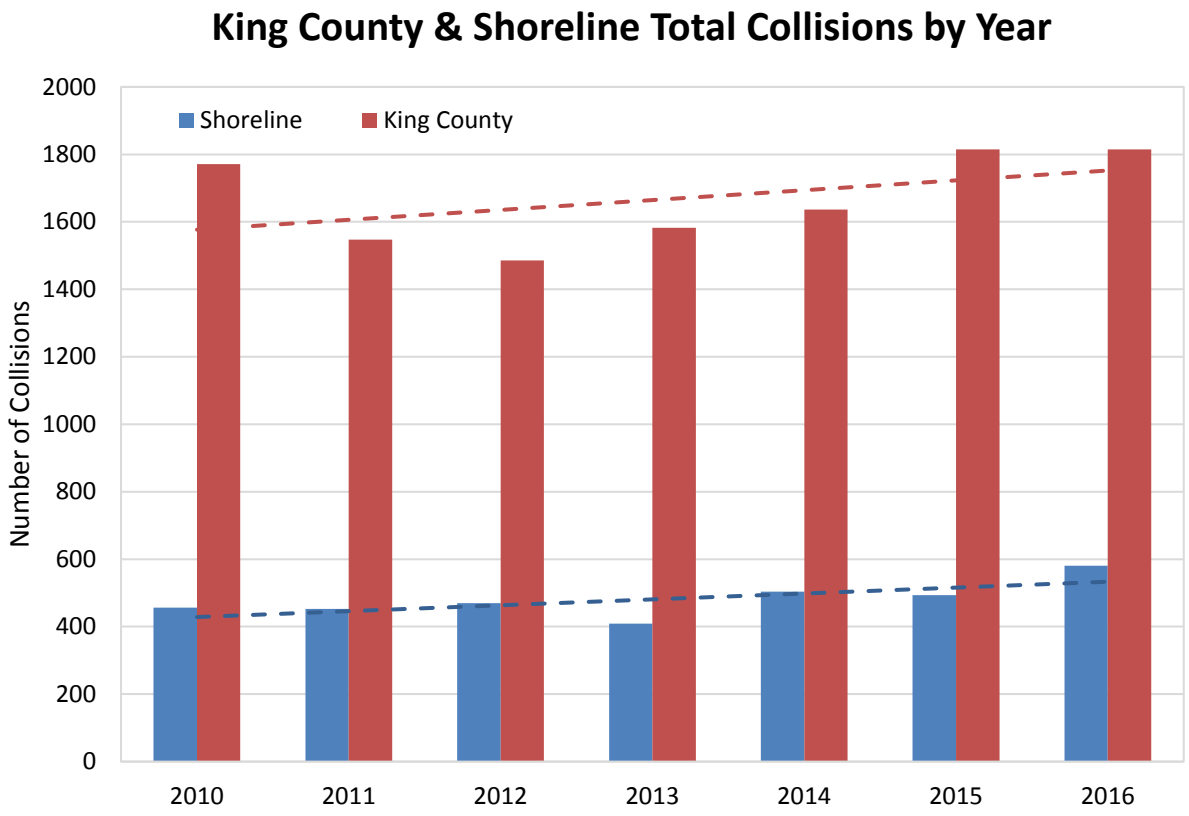
	2010	2011	2012	2013	2014	2015	2016
Fatal	2	1	1	1	1	1	0
Evident Injury	48	33	44	26	37	28	40
Serious Injury	6	9	5	9	11	8	9
Possible Injury	105	111	107	106	122	127	143
No Injury	285	290	305	263	318	320	376
Unknown	11	9	8	4	15	9	13
Total	**457**	**453**	**470**	**409**	**504**	**493**	**581**

The total number of collisions in 2016 is up from 2015. Data from 2016 marks the first year in which the trend line for total collisions since 2010 is increasing, with an average increase of 17 additional collisions per year. The number of Evident and Serious Injury collisions is trending slightly downward, generally accounting for between 8-11% of total collisions. The Injury Collisions section provides more detailed analysis of injury collision trends.



Regional Comparison

To better understand how the uptick in collisions in Shoreline relates to the broader region, a comparison to King County collision data was prepared. As shown in the chart below, the number of total collisions in King County has also been rising over the last five years, at a slightly higher rate than Shoreline collisions. King County collision data was taken from the WSDOT Crash Data Portal.



Societal Costs

Traffic collisions have considerable impact not only on the people directly involved in the collision but also on the community as a whole. Below is the Washington State Department of Transportation's assessment of motor vehicle collision costs by severity. The information provided includes estimates for the average economic cost per death, per injury, and per property damage collision. The economic cost estimates are a measure of the productivity lost and expenses incurred because of the collision; they do not reflect what society is willing to pay to prevent a statistical fatality or injury.

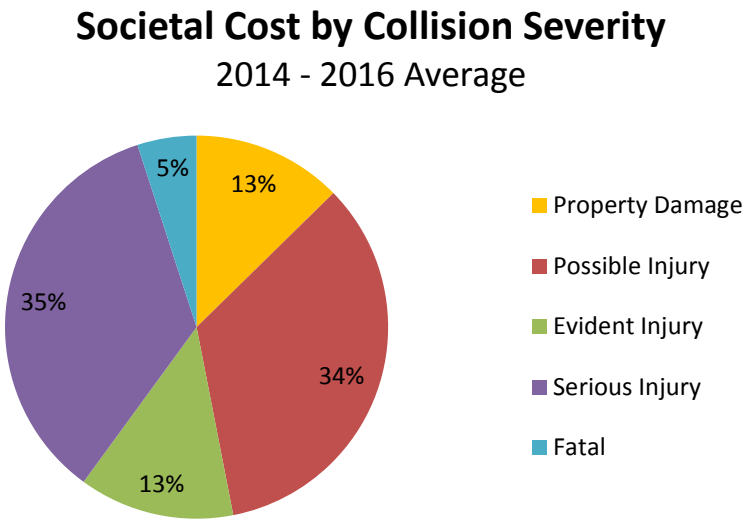
- Fatality $2,000,000
- Serious Injury $1,000,000
- Evident Injury $100,000
- Possible Injury $70,000
- Property Damage Collision $10,000

Source: WSDOT Traffic Safety Management Office

Below is a summary of societal costs for collisions in Shoreline from 2014 through 2016. Although there has been an uptick in total collisions, the number of fatal, serious, and evident injury collisions, which represent much higher societal cost than other collision types, remains relatively consistent with previous years.

Type of Collision	2014	2015	2016
Property Damage	$3,180,000	$3,200,000	$3,760,000
Possible Injury	$8,540,000	$8,890,000	$10,010,000
Evident Injury	$3,700,000	$2,800,000	$4,000,000
Serious Injury	$11,000,000	$8,000,000	$9,000,000
Fatal	$2,000,000	$2,000,000	$0
Total	**$28,420,000**	**$24,890,000**	**$26,770,000**

The chart below summarizes the 3 year average societal cost by collision severity. Serious Injury collisions account for the majority of the societal cost at 35%, but represent only 2% of total collisions. Property Damage collisions account for 64% of the total collisions, but represent only 13% of the societal cost.



Contributing Circumstances

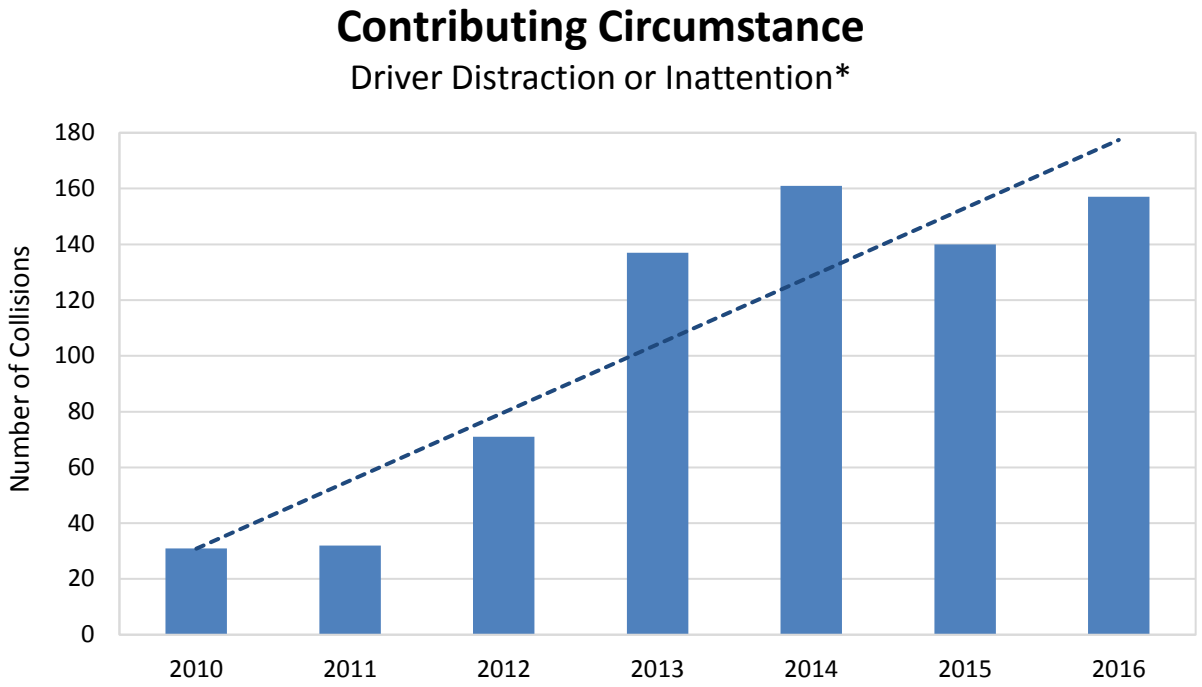
The top three contributing circumstances for collisions in 2016 were, “Driver Distraction or Inattention”, “Did Not Grant Right of Way”, and “Other”. “Exceeding Safe Speed” continues to decline as a cited contributing circumstance.

Contributing Circumstance	Percent of 2016 Collisions
Driver Distraction or Inattention	27%
Did Not Grant Right of Way	23%
Other	12%

Distracted Driving

The graphic below is taken from the Target Zero plan. Shoreline’s distribution of distracted driving related collisions is generally on trend with statewide numbers.

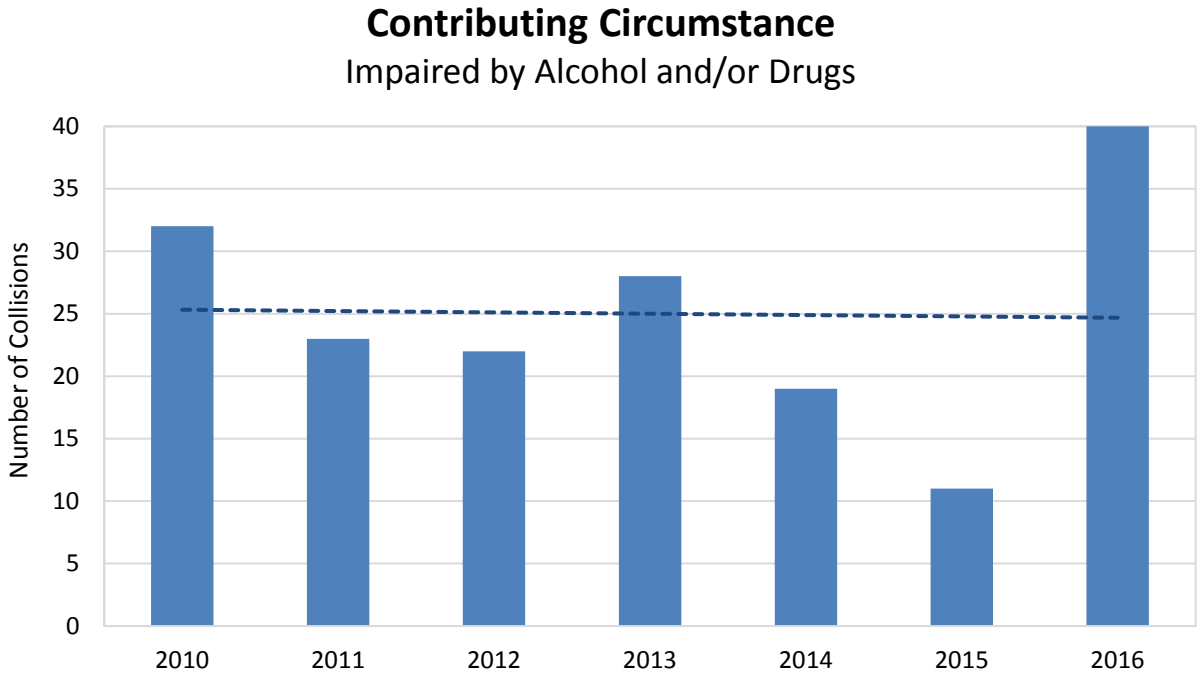
*Source: Target Zero Washington (http://targetzero.com/)



*Driver Distraction or Inattention includes the following classifications: *Unknown Driver Distraction, Inattention, Driver Operating Other Electronic Devices, Driver Operating Hands-Free Wireless Device, Driver Operating Handheld Telecommunication Device, Driver Interacting with Passengers/Animals, Driver Grooming, Driver Eating or Drinking, Driver Distractions Outside Vehicle, Driver Adjusting Audio or Entertainment, and Other Driver Distractions Inside Vehicle.*

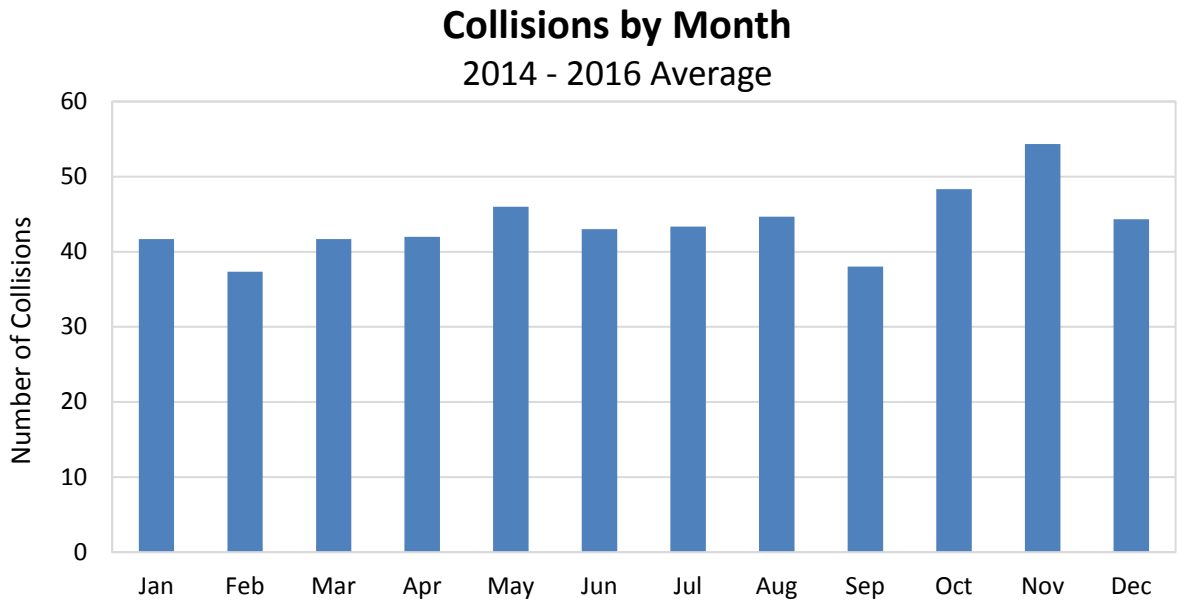
Drug and/or Alcohol Impairment

Another contributing circumstance of note is driver or pedestrian impairment by alcohol or drugs. Although this contributing factor represents only 7% of total collisions, there was a significant spike in the number of 2016 collisions related to drug and/or alcohol impairment as shown in the following chart; double in comparison to the 2013-2015 average. There is also a significant relationship between impairment and injury which is discussed in the Injury Collisions section.

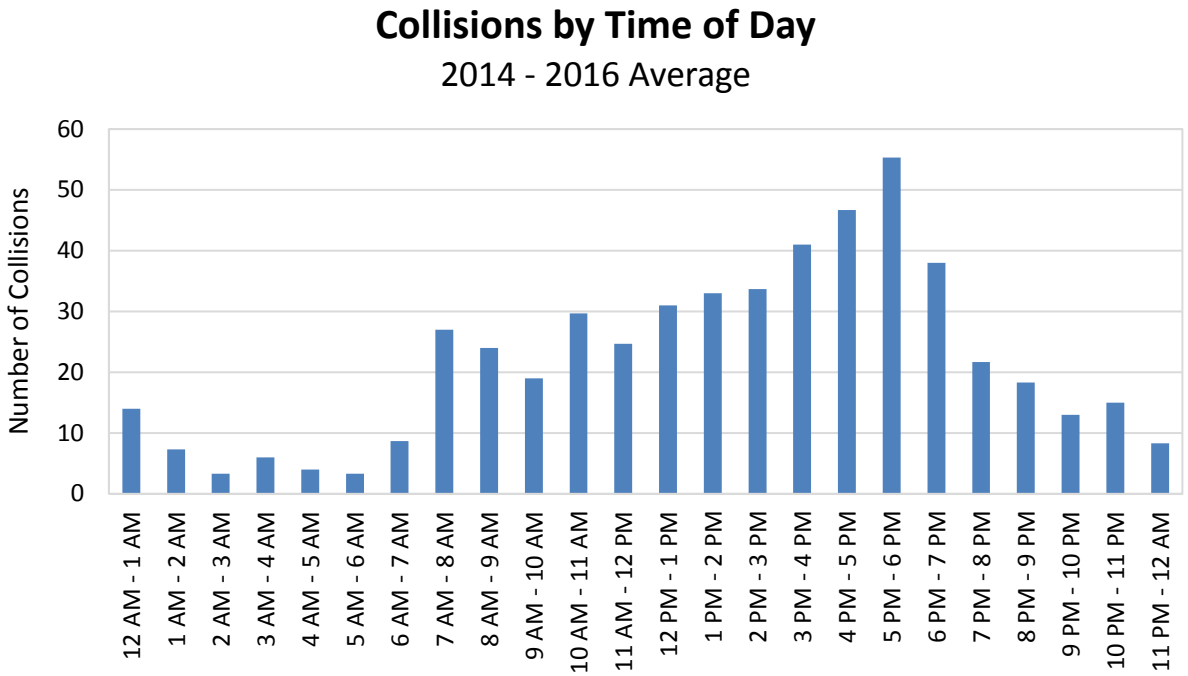


Month and Time of Day

November is the month with the highest overall and injury collisions, consistent with the statewide trend.

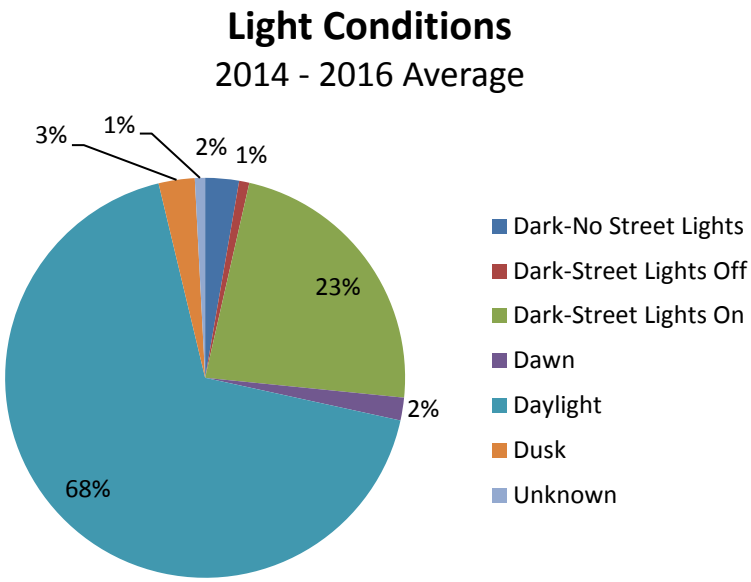


Collisions in Shoreline most often occur during the PM peak hour of 5 to 6 PM. Injury collisions most often occurred during the PM peak as well.

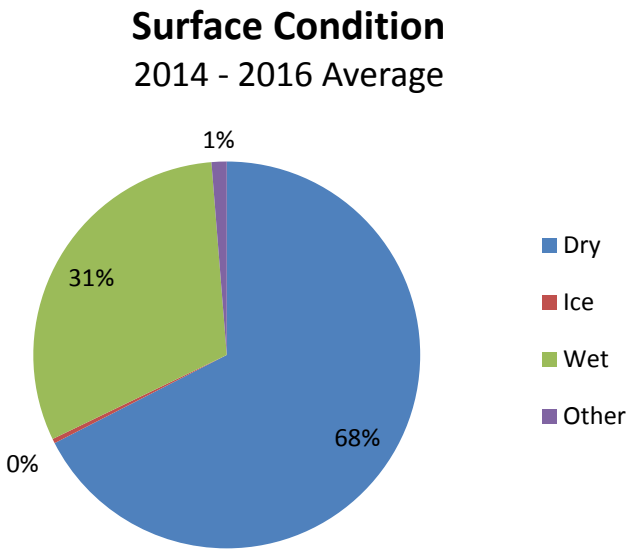


Light and Surface Condition

There are seven categories of light conditions and four categories of surface conditions for pavement. Most collisions occur during daylight hours, with "Dark – Street Lights On" representing the next highest category. Injury collisions follow a similar trend. It is worth noting that pedestrian related collisions are represented during hours of darkness at a greater rate with 17% reported with light conditions Dark-No Street Lights, or Dark-Street Lights Off, emphasizing the importance of adequate street lighting.

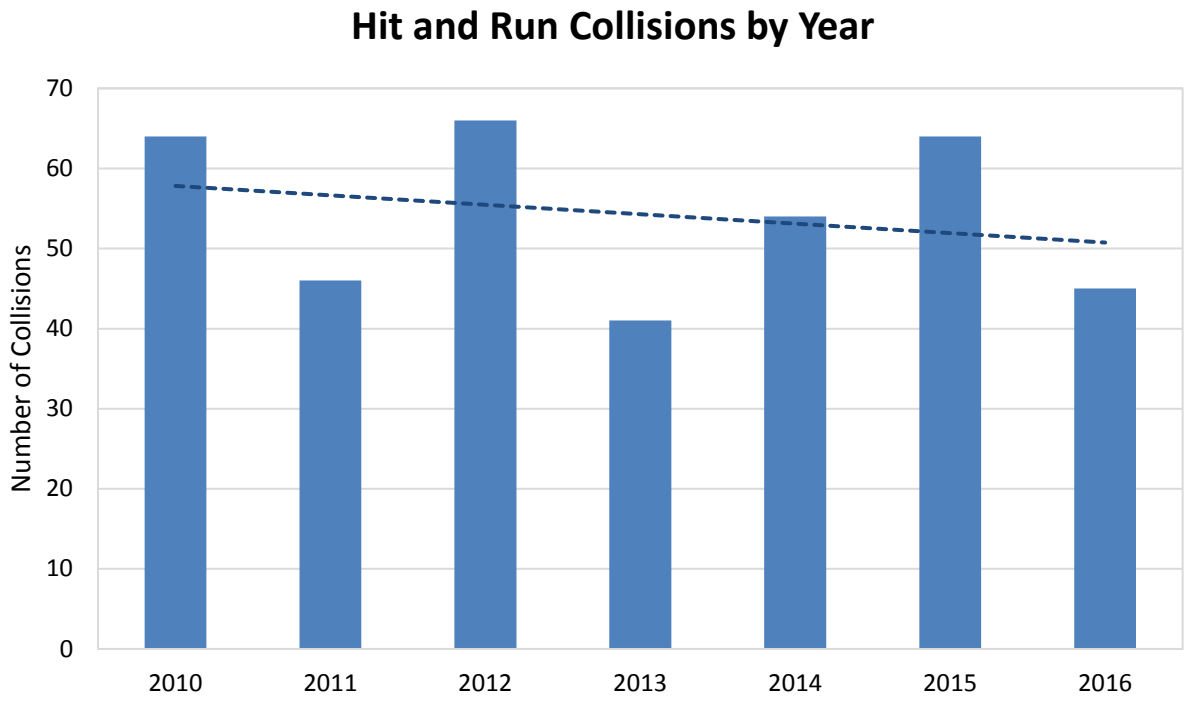


68% of collisions occur on dry pavement. Injury collisions follow a similar trend.



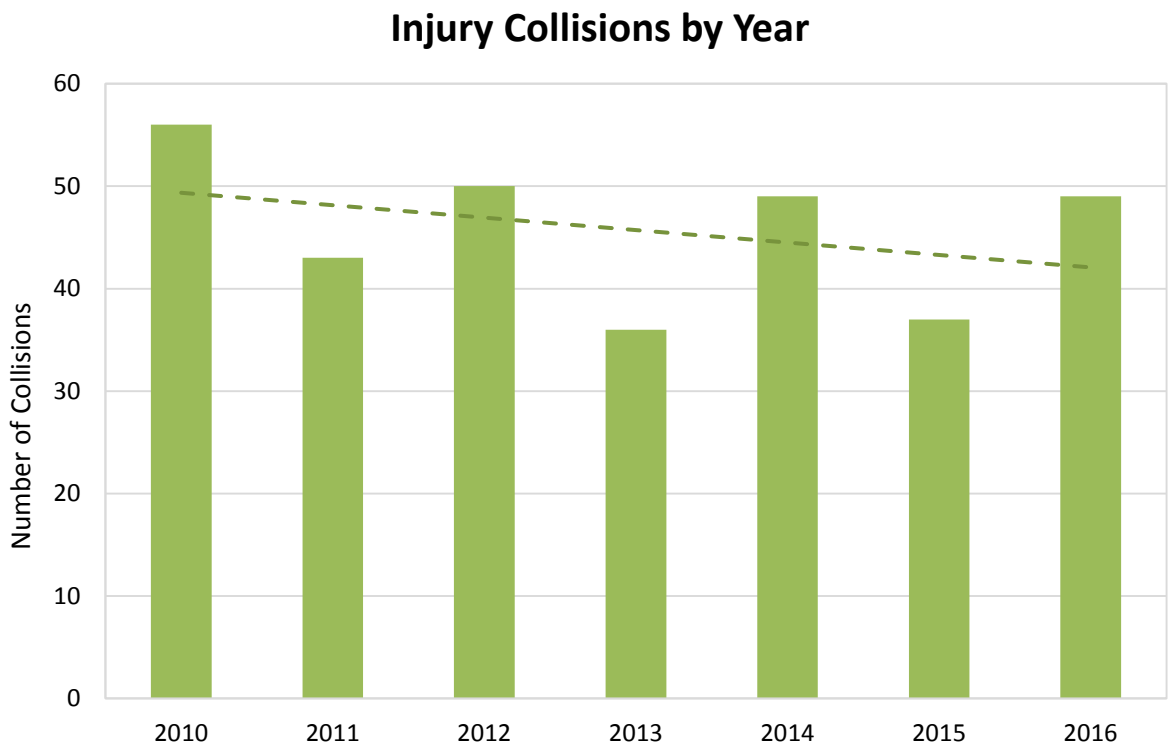
Hit and Run

The number of reported hit and run collisions has been steadily declining since 2010 and represents just under 8% of total collisions in 2016.

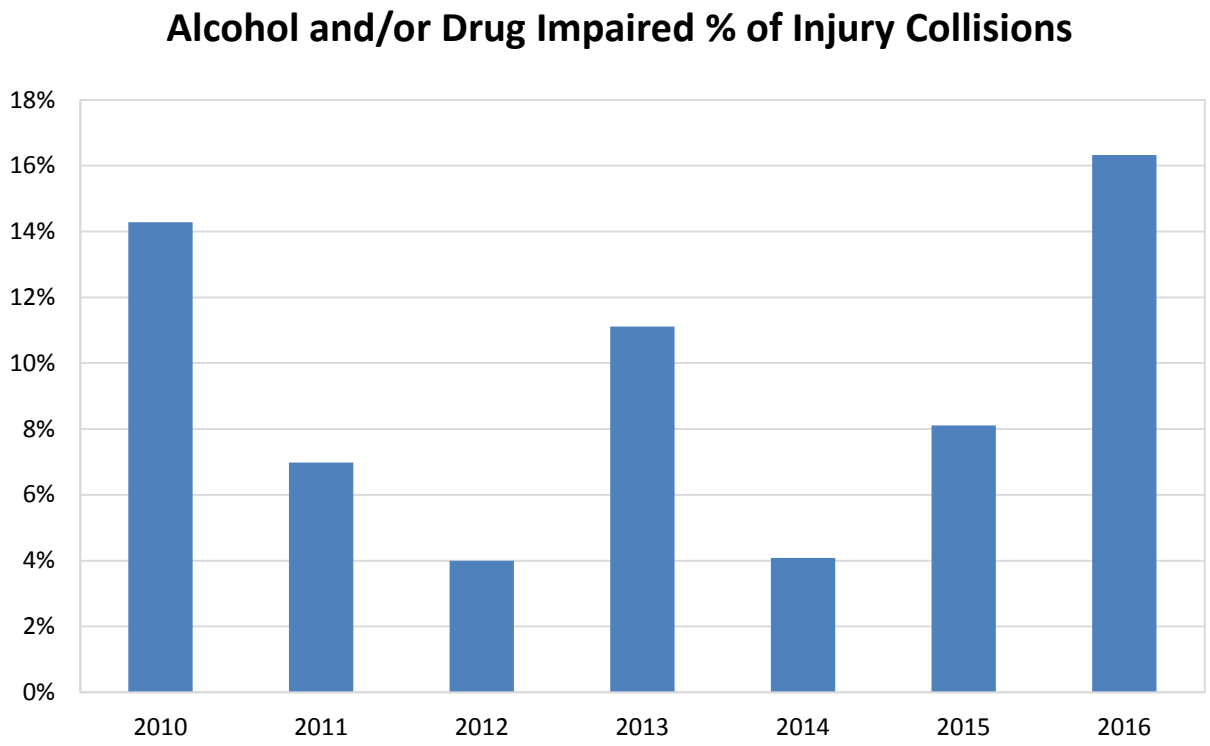


Injury Collisions

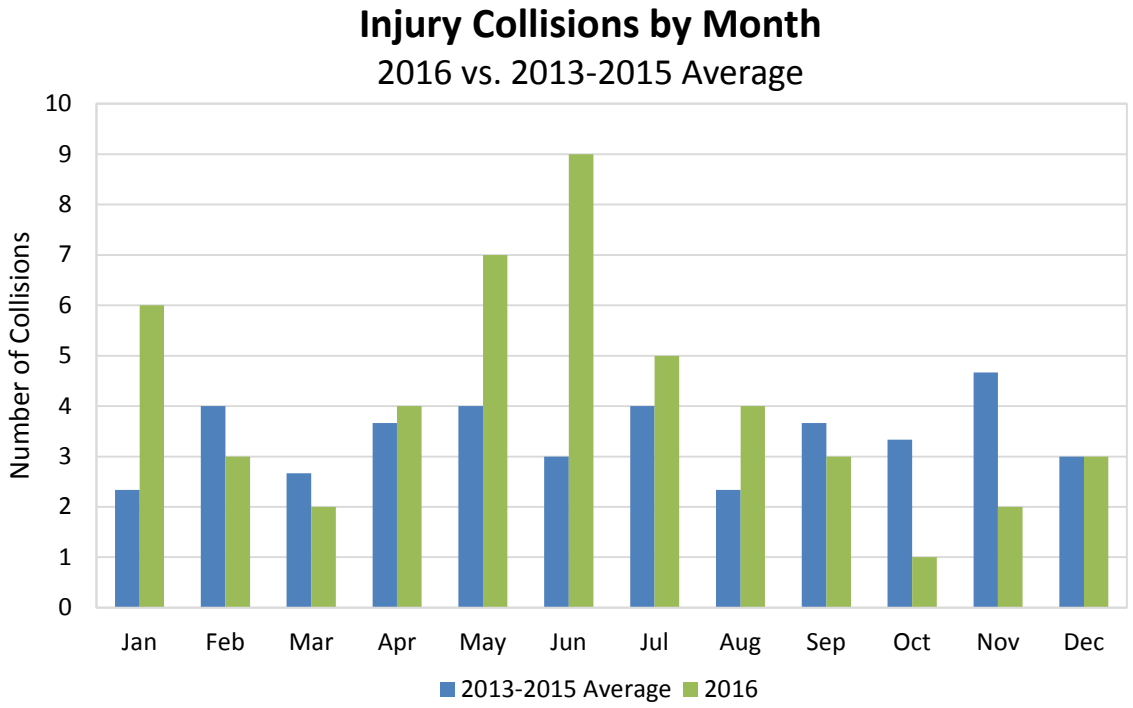
For the purpose of injury collision analysis, Fatal, Serious, and Evident Injury collisions were analyzed, excluding Possible Injury collisions. In 2016, the primary contributing circumstance accounting for injury collisions was listed as “Driver Distraction or Inattention” (22%). “Did Not Grant Right of Way” was the second most commonly cited factor (18%). As shown below, the trend for Injury Collisions is down, decreasing approximately 1.2 collisions per year on average.



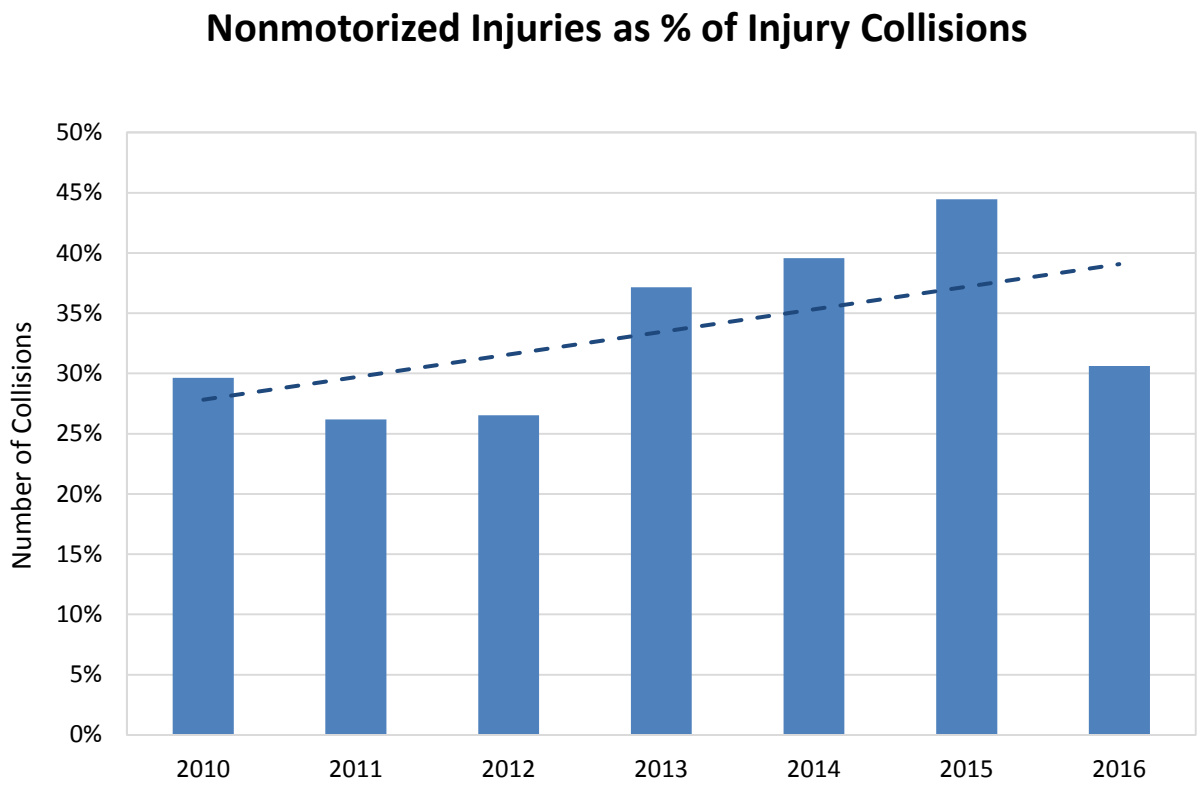
2016 saw a significant spike in injury collisions related to drug or alcohol impairment. While Alcohol and/or drug impaired related collisions represented only 7% of total collisions, they accounted for more than 16% of Serious, Evident, and Fatal injury collisions.



Also of note, the 2016 months of May through August saw an increase in injury collisions in comparison to the average of the last 3 years. There were no clear correlations between these summer 2016 collisions and age, sobriety, or other contributing circumstance.



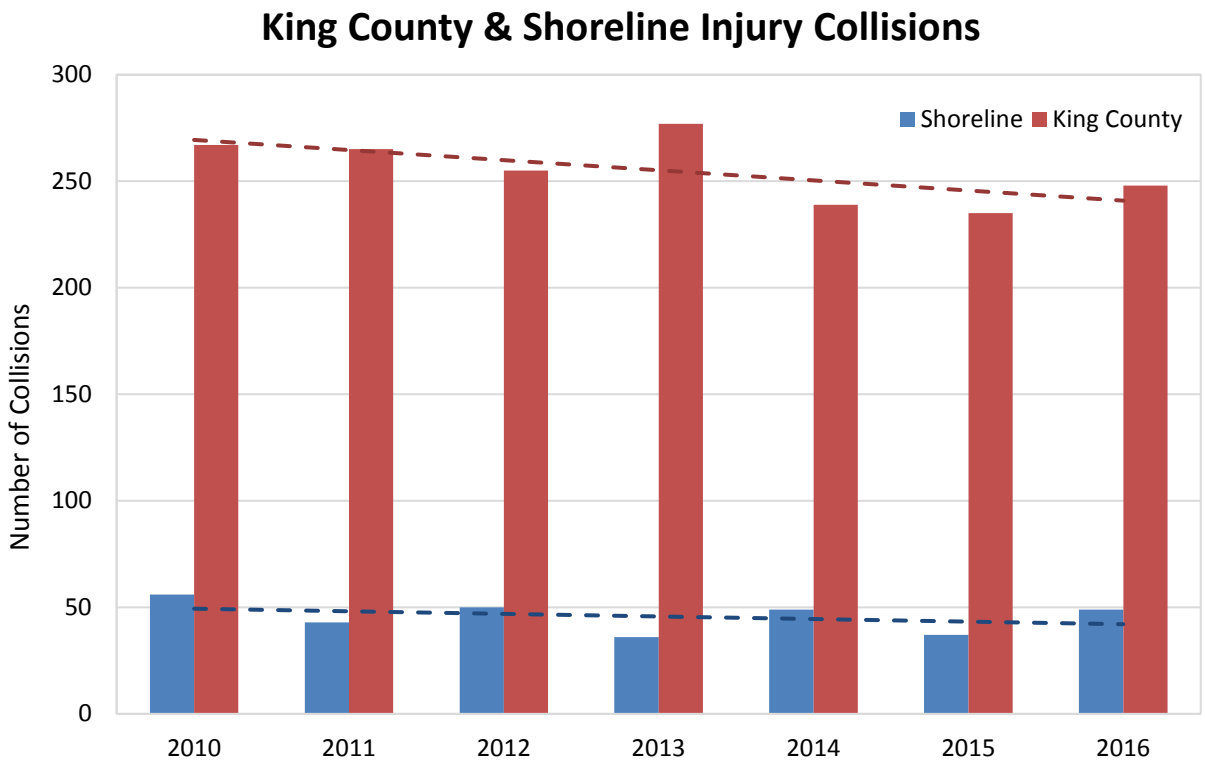
The percent of non-motorized collision injuries as part of the total injury collisions dropped in comparison to the last three years, however the overall trend is still on the rise.



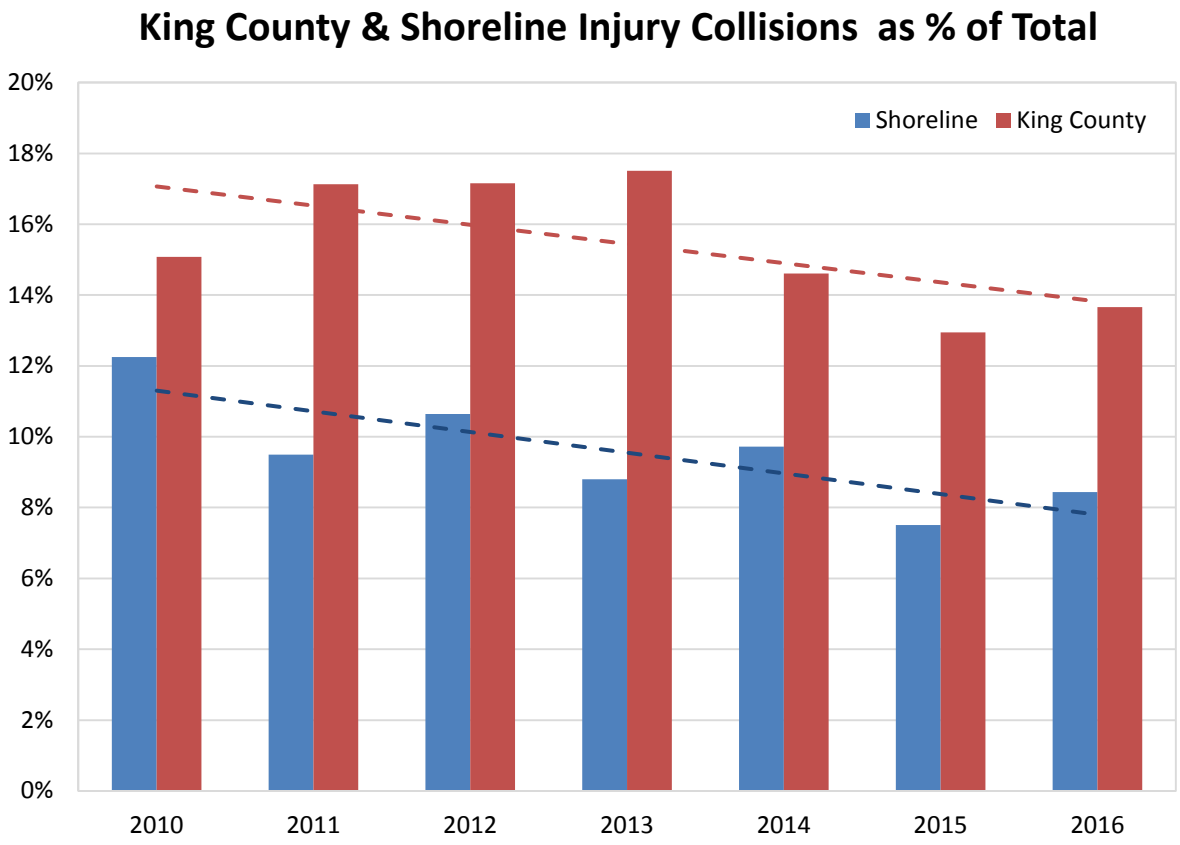
No other notable trends for injury collisions were revealed during analysis such as surface condition, age, or time of day.

Injury Collision Regional Comparison

In comparing injury collision trends to the broader region, Serious, Evident, and Fatal injury collisions in Shoreline and King County are down slightly, with King County's rate falling slightly faster.



The percent of injury collisions as part of the total number of collisions for both King County and Shoreline show a downward trend, falling at roughly equal rates.



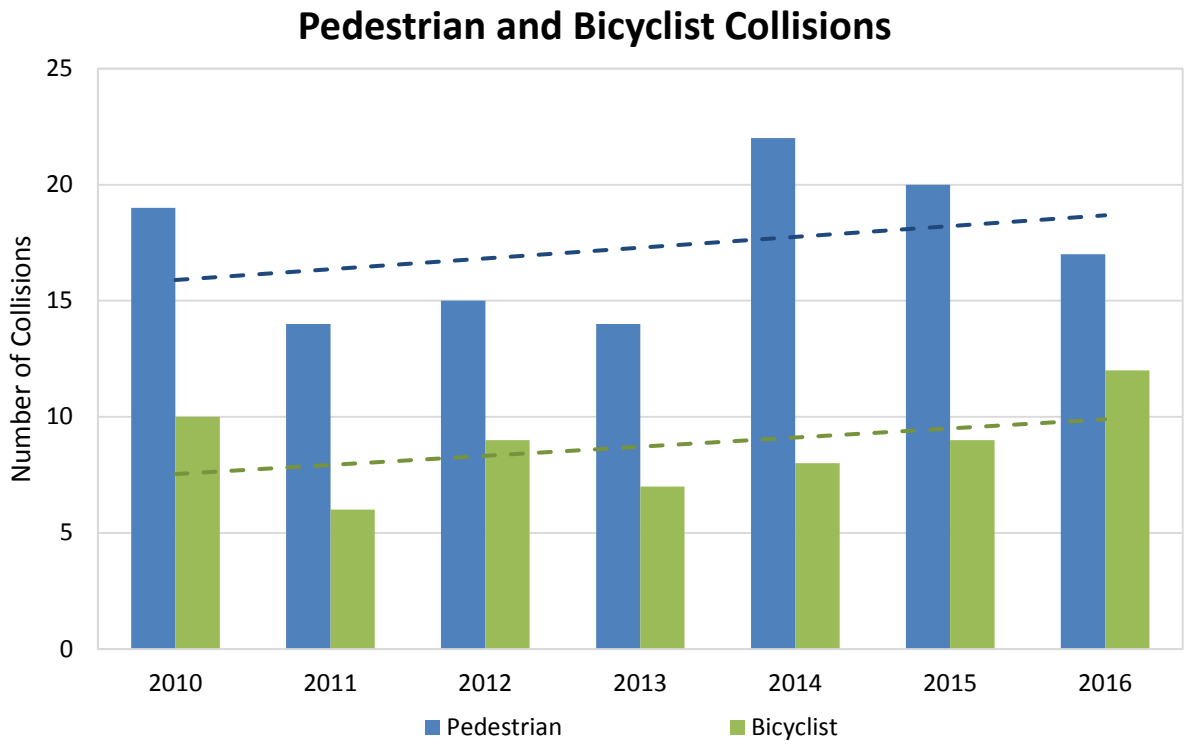
Expanding this comparison statewide, the following table provides a breakdown of Shoreline, King County and Statewide Serious and Fatal Injury collision rates. Shoreline rates are significantly lower than the Statewide and County rates.

	2016 Serious Injury Rate per 10,000 Population	2016 Fatal Injury Rate per 10,000 Population
Statewide	2.68	.71
King County	2.62	.42
Shoreline	1.64	0

**Data from WA State Crash Data Portal*

Pedestrian and Bicycle Collisions

Pedestrian collisions are down in comparison to previous two years, with an overall upward trend since 2010. The number of bicyclist related collisions is the highest in the monitoring period (2010-2016).



The primary motor vehicle contributing circumstance listed for both pedestrian and bicycle collisions are "Did Not Grant Right of Way". Additional information regarding pedestrian and bicycle collision locations is provided in the High Collision Locations section of this report.

	2010	2011	2012	2013	2014	2015	2016
Bike Collisions	10	6	9	7	8	9	12
Pedestrian Collisions	19	14	15	14	22	20	17
Total Nonmotorized	**29**	**20**	**24**	**21**	**30**	**29**	**29**

One notable trend from the light condition analysis was that pedestrian collisions are represented at a significantly greater rate during hours of darkness than total collisions. In comparison to a general rate of 3%, 17% of pedestrian related collisions are reported with light conditions Dark-No Street Lights, or Dark-Street Lights Off, emphasizing importance of adequate street lighting.

Pedestrian collisions occur primarily at intersection and midblock crossings as opposed to when the pedestrian is walking along the road which represents only 6.5% of pedestrian collisions, comparable to the national trend. Knowing that the majority of collisions occur when pedestrians are trying to cross the road allows us to target lighting and other improvements to these locations.

High Collision Locations

The top 20 High Collision Locations are identified by reviewing 3 years of collision data, separating locations into Intersections or Segments in order to better target mitigation strategies. There is no specific industry standard as to what number of collisions or collision rate is considered "high". Nationally, locations with 5 or more correctable collisions in a 12 month period may be considered for some additional traffic control devices, such as stop signs and traffic signal revisions.

The following tables list locations with the highest number of reported collisions in descending order. Also included are injury collisions for the same period; all locations with 3 injury collisions or more are provided in these lists. Collision rate is provided for context; while a high number of collisions may seem alarming, when traffic volumes and segment lengths are taken into account, the rate may be more reflective of the overall risk associated with a location. Rate does not drive location prioritization because one collision on a very low volume street can drive the rate up, therefore investing in mitigation for a location with one or two collisions may not move Shoreline closer to the goal of zero fatality and serious injury collisions.

A review of pedestrian and bicycle collision locations over a 5 year period is included in this section as well. Locations with 3 or more pedestrian collisions or 2 or more bicycle collisions in a five year period are provided in these tables.

Maps with 3 year total collision and injury collision data as well as 5 year non-motorized collision data are provided in Appendices A-C for reference.

(2014-2016) High Collision Intersections

Location	Total Collisions	Injury Collisions	Rate
Aurora Ave N & N 155th St	47	1	0.84
Aurora Ave N & N 175th St	34	3	0.59
19th Ave NE & Ballinger Way NE	30	3	1.04
Aurora Ave N & N 160th St	30	3	0.68
Aurora Ave N & N 200th St	30	1	0.70
15th Ave NE & Ballinger Way NE	29	0	0.72
Aurora Ave N & N 185th St	28	3	0.56
Meridian Ave N & N 175th St	27	2	0.73
3rd Ave NW & NW Rich. Beach Rd	25	2	1.11
Aurora Ave N & N 165th St	21	0	0.46
Aurora Ave N & N 163rd St	20	0	0.47
Aurora Ave N & N 152nd St	17	1	0.53
15th Ave NE & NE 175th St	17	1	0.63
15th Ave NE & NE 155th St	16	2	0.72

Meridian Ave N & N 185th St	16	1	0.65
Aurora Ave N & N 192nd St	16	1	0.45
10th Ave NE & NE 175th St	15	0	0.83
Midvale Ave N & N 175th St	14	2	0.49
Westminster Way N & N 155th St	12	0	0.65
15th Ave NE & NE 180th St	12	2	0.63

(2014-2016) High Collision Segments

Location	Total Collisions	Injury Collisions	Rate
Ballinger Way NE from 19th Ave NE to 15th Ave NE	28	2	3.99
Aurora Ave N from N 149th St to N 152nd St	14	3	2.46
Aurora Ave N from N 170th St to Ronald Pl N	13	2	1.96
Aurora Ave N from Firlands Way N to N 192nd St	13	2	2.81
Aurora Ave N from N 160th St to N 163rd St	12	0	2.62
NW Richmond Beach Rd from 3rd NW to 8th NW	12	1	2.97
Aurora Ave N from N 175th St to Ronald Pl N	11	1	1.21
Aurora Ave N from N 167th St to N 170th St	10	1	2.18
N 160th St from Linden Ave N to Aurora Ave N	9	0	9.81
Aurora Ave N from N 165th St to N 167th St	7	0	1.34
Aurora Ave N from N 155th St to Westminster Way N	7	0	1.01
Aurora Ave N from N 200th St to N 205th St	7	1	0.85
Aurora Ave N from Ronald Pl N to N 175th St	7	0	2.04
19th Ave NE from Ballinger Way NE to NE 205th St	7	2	4.54
15th Ave NE from Forest Park Dr to Ballinger Way NE	7	1	3.16
Aurora Ave N from N 152nd St to N 155th St	7	0	1.07
15th Ave NE from NE 172nd St to NE 175th St	6	0	3.09
Aurora Ave N from N 163rd St to N 165th St	6	0	1.30
NE 175th St from 12th Ave NE to 15th Ave NE	6	0	3.04
Aurora Ave N from N 182nd St to N 184th St	5	0	1.98

(2012–2016) Pedestrian Collision Locations

Location	Pedestrian Collisions
Linden Ave N & N 185th St	4
Aurora Ave N & N 192nd St	4
Aurora Ave N & N 165th St	4
Aurora Ave N & N 160th St	3

Meridian Ave N & N 200th St	3
19th Ave NE & Ballinger Way N	3
Aurora Ave N & N 185th St	3
Ballinger Way NE from 15th Ave NE to 19th Ave NE	3

(2012–2016) Bicyclist Collision Location

Location	Bicyclist Collisions
Aurora Ave N & N 160th	2
Aurora Ave N & Westminster Way	2
Meridian Ave N & N 185th Street	2
Midvale Ave N from N 175th to N 185th	2

Collision Reduction Strategy

The City of Shoreline strives to reduce overall, injury, and fatality collisions on its roadways consistent with the Washington State Strategic Highway Safety Plan's Target Zero Initiative discussed in the following section.

Roadway users can make Shoreline roads safer too:

- Get educated on the rules of the road.
- Obey the law.
- Share the road with bicyclists.
- Wear reflective and bright clothing to increase visibility when walking or biking.
- Cross the street safely; stop, look, listen and make eye contact with drivers.
- Be alert.
- Don't text while driving; focus on the driving task.
- Never drive while under the influence of alcohol and/or drugs.
- Be courteous and patient.

Target Zero

Target zero is Washington State's Strategic Highway Safety Plan for zero Fatal and Serious Injury collisions by the year 2030. This plan:

- Sets statewide priorities for all traffic safety partners over a 3-4 year period.
- Provides various strategies to address each emphasis area and factor.
- Helps guide federal and state project funding toward the highest priorities and most effective strategies.
- Monitors outcomes at a statewide level for each priority area.

Target Zero focuses on the 3 E's outlined below, a regular practice for the City of Shoreline.

Education Gives drivers, pedestrians, and bicyclists information about how to make safer choices. Examples of this include Shoreline's Neighborhood Traffic Safety and Action Plans, outreach to residents that provides information about the dangers of speeding and encourages safer travel, utilizing radar speed carts to remind drivers of their speed, web-based information, and working with schools on Safe Routes to School plans.

Enforcement Utilizes the Shoreline Police Department Traffic Division to focus enforcement efforts on problem areas to increase community awareness and compliance. Emphasis patrols can target specific violations such as speeding, failure to yield to pedestrians, cell phone use while driving, and disobeying traffic control devices.

Engineering Implements best engineering practices to prevent or reduce the severity of collisions. This includes operational evaluation of facilities (including signals, signs, striping and guardrail, etc.), designing capital improvements with safety as a guiding factor, installing traffic calming devices (such speed humps, chicanes, or traffic circles for example), and providing routine maintenance of traffic assets.

In addition to the Three E's, Target Zero focuses on the following areas:

- **Policy:** Changing laws, agency rules or policies to support safer roads and;
- **Emergency Medical Services**: Providing fast and high-quaility medical response to injury collisions.

As shown in the table below, the number of Fatal and Serious Injury collisions in Shoreline has been relatively low since 2010, with 1 fatal collision per year on average, and just over 8 serious injury collisions per year on average. Appendix D provides a map of Serious and Fatal Injury collisions for the last 3 years.

	2010	2011	2012	2013	2014	2015	2016
Fatal	2	1	1	1	1	1	0
Serious Injury	6	9	5	9	11	8	9

These relatively low numbers of Serious Injury and Fatal collisions make it somewhat difficult to provide any statistically significant links to Target Zero recommended strategies, however there are a few key takeaways from the 2016 updated plan worth consideration.

Pedestrian Collisions and Vehicle Speed

For local jurisdictions, the Target Zero Plan focuses on speed as major contributing factor to pedestrian injury outcome. The plan specifically highlights expanded use of speed cameras which can reduce crashes 20-25%. Pedestrian collision trends from Target Zero 2012-2014 analysis showed that 42% of pedestrian fatalities occur on roads with speed limit of 30 or 35 mph and that more than 60% of both pedestrian fatalities and serious injuries occured while the pedestrian was crossing the road.

In addition, relatively recent legislation grants cities the authority to post speed limits at 20 mph. The City of Seattle has a pilot program currently underway which implements this 20 mph speed limit in multiple locations throughout the City. Shoreline staff will track progress in this respect and report on any significant safety benefits gleamed from our neighbor city experience.

Given the upward trend in nonmotorized collisions, as well as the upward trend in the representation of nonmotorized collisions as part of overall injury collisions, continued focus on nonmotorized safety strategies and speed reduction is recommended.

Distracted Driving

As noted earlier in the Injury Collision Section, distracted driving continues to be a significant contributing factor. Additionally, the Target Zero plan states that it is thought to be underreported, emphasizing the need for continued focus on driver education and targeted emphasis patrols.

Impairment

With the spike in alcohol and/or drug related total and injury collisions, education and targeted emphasis patrols for impaired driving is recommended for 2017.

Ongoing Education and Enforcement Opportunities

The Police Department and Traffic Services will continue to coordinate regularly to review speed differential and collision data to identify additional opportunities.

The Neighborhood Traffic Action Plans (NTAP) and Neighborhood Traffic Safety Program (NTSP) managed through Traffic Services will continue to utilize education to support neighborhood traffic safety concerns. Radar speed carts and the volunteer crosswalk flag program are examples of driver education tools frequently utilized.

Police will continue to provide education outreach efforts through the following types of activities:

- Safe driving presentations to at-risk drivers ages 16-19 years old. The Shoreline Police School Resource Officer and Traffic Unit work jointly to support this effort.
- Safe driving and traffic complaint reporting presentations at neighborhood meetings. These are conducted through joint efforts between the Shoreline Police Community Outreach Officer and Traffic Unit.

Location Specific Collision Reduction Strategy

Shoreline Police and Public Works staff work together to review High Collision Locations each year. This data driven approach to collision reduction facilitates strategic and systematic prioritization of limited City resources. The top locations were prioritized based on number of collisions, with consideration of injury collisions, in order to maximize the benefit of recommendations and improvements, working toward the goal of decreasing the number of overall and injury collisions.

Using the Three E's as described in the previous section, and drawing from specific strategies outlined in the Target Zero Plan, recommendations were developed to address identified collision patterns. In some cases, greater investment is needed to address a safety need. These locations are added to the Transportation Improvement Plan (TIP) to identify potential project funding sources and to position the City for grant opportunities.

(2014-2016) High Collision Intersection Recommendations

Location	Recommendation
Aurora Ave N & N 155th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N & N 175th St	Signal timing changes recently implemented. Monitor for improvement.
19th Ave NE & Ballinger Way NE	Project identified in TIP. Pursue grant opportunities. Recently implemented Flashing Yellow Arrow phasing.
Aurora Ave N & N 160th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N & N 200th St	Signal timing changes recently implemented. Monitor for improvement.
15th Ave NE & Ballinger Way NE	Project identified in TIP. Pursue grant opportunities.
Aurora Ave N & N 185th St	Signal timing changes recently implemented. Monitor for improvement.
Meridian Ave N & N 175th St	Growth Project (TIF). Grant funding for design slated for 2018.
3rd Ave NW & NW Rich. Beach Rd	Recently implemented phase changes; collisions reduced significantly (see results section). A CIP rechannelization project will also be implemented in this area for additional safety benefits.
Aurora Ave N & N 165th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N & N 163rd St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N & N 152nd St	Signal timing changes recently implemented. Monitor for improvement.
15th Ave NE & NE 175th St	Growth Project (TIF). Review for near-term phase change improvements.
15th Ave NE & NE 155th St	Review warrants for signal phase changes.
Meridian Ave N & N 185th St	Growth Project (TIF) and slated for Sound Transit Light Rail mitigation.
Aurora Ave N & N 192nd St	Signal timing changes recently implemented. Monitor for improvement.
10th Ave NE & NE 175th St	Review warrants for signal phase changes.
Midvale Ave N & N 175th St	Signal timing changes recently implemented. Monitor for improvement.
Westminster Way N & N 155th St	Active CIP for intersection design; partial improvement funding expected from adjacent redevelopment.
15th Ave NE & NE 180th St	Review warrants for signal phase changes.

The highest priority segment locations and associated recommendations are shown below.

(2014-2016) High Collision Segment Recommendations

Location	Recommendation
15th Ave NE from NE 172nd St to NE 175th St	This segment will be addressed by future Growth Project (TIF).
Aurora Ave N from N 160th St to N 163rd St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 149th St to N 152nd St	Signal timing changes recently implemented. Monitor for improvement.
Ballinger Way NE from 19th Ave NE to 15th Ave NE	Project identified in TIP. Pursue grant opportunities.
Aurora Ave N from N 163rd St to N 165th St	Signal timing changes recently implemented. Monitor for improvement.
N 160th St from Linden Ave N to Aurora Ave N	King County Metro awarded the City a grant for restriping the roadway from 4 lanes to 3 which will address turn related collisions.
Aurora Ave N from N 175th St to Ronald Pl N	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 165th St to N 167th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 182nd St to N 184th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 155th St to Westminster Way N	Signal timing changes recently implemented. Monitor for improvement.
NE 175th St from 12th Ave NE to 15th Ave NE	This segment will be addressed by future Growth Project (TIF).
Aurora Ave N from N 200th St to N 205th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 167th St to N 170th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from Ronald Pl N to N 175th St	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from N 170th St to Ronald Pl N	Signal timing changes recently implemented. Monitor for improvement.
Aurora Ave N from Firlands Way N to N 192nd St	Signal timing changes recently implemented. Monitor for improvement.
19th Ave NE from Ballinger Way NE to NE 205th St	Review for potential on-street parking revisions.
15th Ave NE from Forest Park Dr NE to Ballinger Way NE	Extend scope of 15th Ave NE TIP project description to include this segment.
NW Richmond Beach Rd from 3rd NW to 8th NW	A CIP to restripe the roadway from 4 to 3 lanes will be implemented in this segment to reduce turn related collisions.
Aurora Ave N from N 152nd St to N 155th St	Signal timing changes recently implemented. Monitor for improvement.

The table below shows locations with 3 or more pedestrian collisions in a five year period and associated recommendations.

(2014-2016) Pedestrian Collision Recommendations

Location	Pedestrian Collisions	Recommendation
Linden Ave N & N 185th St	4	Applied for grant in 2016 but not awarded.
Aurora Ave N & N 192nd St	4	Implement Leading Pedestrian Interval; requires new controller software.
Aurora Ave N & N 165th St	4	Will review signal phasing at this intersection; review found pedestrians crossing against the light which may indicate less restrictive phasing is warranted.
Aurora Ave N & N 160th St	3	Implement Leading Pedestrian Interval; requires new controller software.
Meridian Ave N & N 200th St	3	Pedestrian warning signs were installed; no new collisions in 2016.
19th Ave NE & Ballinger Way N	3	Project identified in TIP. Pursue grant opportunities. Recently implemented Flashing Yellow Arrow phasing.
Aurora Ave N & N 185th St	3	Evaluate approaches for pedestrian warning signs.
Ballinger Way NE from 15th Ave NE to 19th Ave NE	3	Project identified in TIP. Pursue grant opportunities. Recently implemented Flashing Yellow Arrow phasing at 19th Ave NE.

The table below shows locations with 2 or more bicyclist collisions in a five year period and associated recommendations

(2014-2016) Bicyclist Collision Recommendations

Location	Bicyclist Collisions	Recommendation
Aurora Ave N & N 160th	2	King County Metro awarded the City a grant for restriping N 160th Street from 4 lanes to 3 which will provide bike lanes and safer interaction with traffic. Implement Leading Pedestrian Interval (requires new controller software).
Aurora Ave N & Westminster Way	2	Active CIP for intersection design; partial improvement funding expected from adjacent redevelopment.
Meridian Ave N & N 185th Street	2	TIF Growth Project and slated for Sound Transit Light Rail mitigation.
Midvale Ave N from 175th to 185th	2	Review access point sight distance and trail warning treatments.

2016 Implemented Improvements and Emphasis Areas

Listed below are safety strategies implemented in 2016. Progress on safety benefits will be tracked in future Annual Traffic Reports, as it is too soon to gauge results.

Public Works

- Aurora signal retiming was completed in late 2016. See preliminary summary in Results section.
- High visibility crosswalk flags were installed for 43 crossings.
- Worked with Shoreline School District; Rapid Rectangular Flashing Beacon installed at 175th and Wallingford and at 155th and Wallingford.
- Public outreach including neighborhood meetings and currents articles.
- Updated Traffic Services website for easier access to Neighborhood Traffic Safety Program (NTSP) and Driver Education tools.

Shoreline Police Department

- On September 9, 2016, Shoreline Police issued 70 citations, contacting nearly 100 violators. Resources for this emphasis was provided through the Target Zero grant for cell phone emphasis to reduce collisions.
- 58 Child Restraint Inspections were conducted in 2016.
- Shoreline participated in several DUI emphases. In October 2016, Shoreline partnered with multiple agencies throughout King County for a large scale DUI emphasis. There were over 35 impaired drivers arrested, several suspended drivers, and some subjects with warrants. A felony DUI arrest was also made; the subject had 5 prior convictions of DUI.
- In August 2016, several elementary schools within the City that are situated on high volume roads were contacted by the Traffic Sergeant to discuss pupil safety of walkers, bus riders, and drop off were addressed. Through these conversations two main concerns were identified and addressed to the degree possible through Shoreline Police and Traffic Services efforts.
- Prior to fall school start, all schools were visited by a traffic officer to ensure signs and other school safety devices were visible and functioning. Traffic Services and Shoreline Community Response Team worked to resolve issues identified.
- The Traffic Unit increased presence during the first 3 weeks of school. High priority was Parkwood and Meridian Park elementary. Schools throughout the city took notice of the increased Police presence.

Improvement Results

The following projects were recommended through prior Annual Traffic Report efforts. Implementation of these projects resulted in the reduction of collisions at these locations.

Richmond Beach Rd & 3rd Ave NW Signal Phase Changes

Phase changes were implemented February 2016 to add left turn arrows for eastbound NW Richmond Beach Rd. In a 3 year period before the phase changes, there was an average of 4.7 left turn collisions per year. Following the phase change, 3 left turn collisions have been reported in 2016, reducing the rate of collision by 42.5%.

Ashworth Ave N and N 192nd All Way Stop Control

Stop signs were installed in May 2015 to implement all-way stop control. In a 3 year period before the stop sign installation, 7 collisions were reported. Following stop sign installations, no collisions have been reported.

Meridian Ave N and N 200th Street Pedestrian Warning Sign Installation

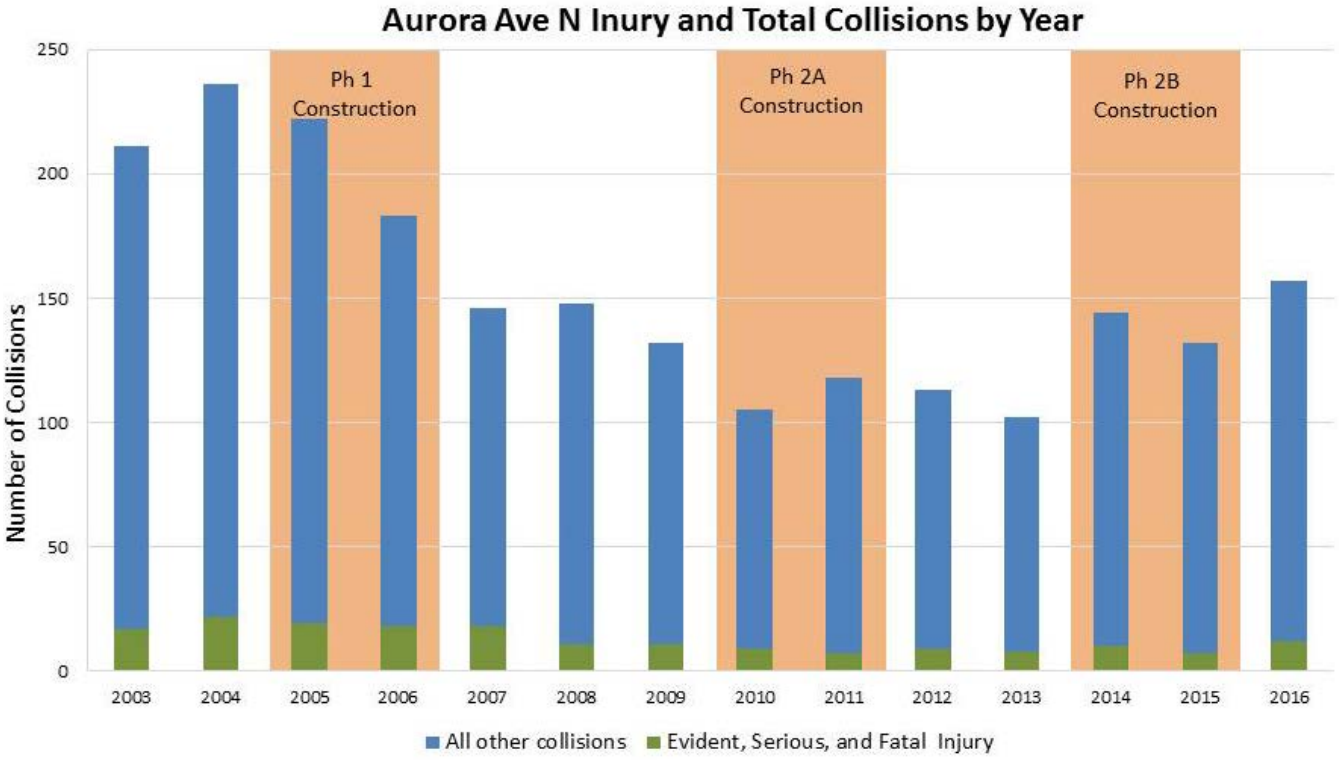
Pedestrian warning signs were installed on the signal structure in summer of 2015. Prior to the sign installation, there were 3 pedestrian collisions in a 3 year period. Since the sign was installed, there have been no new pedestrian collisions.

5th Ave N and NE 175th Street Signal Phase Changes

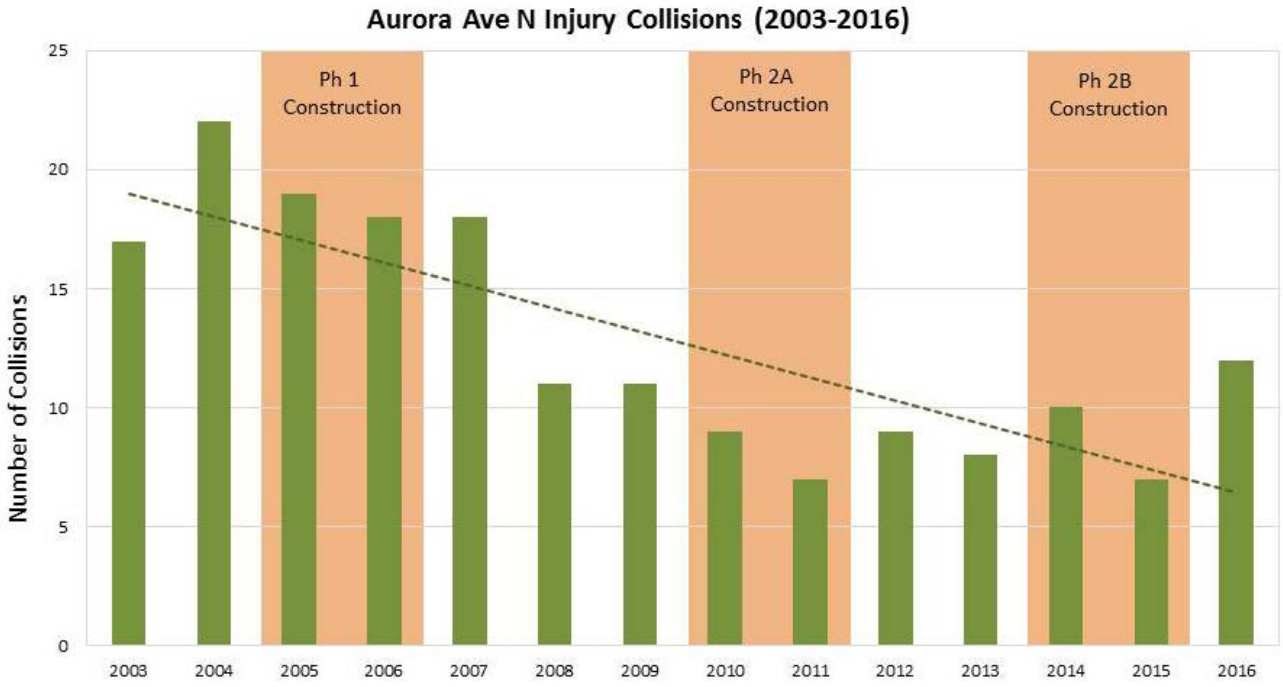
Protected permissive phasing was implemented for the north-south movements in summer of 2014. From 2012 through summer of 2014, the intersection experienced 11 collisions. After phase changes (summer 2014 – 2016), only 5 collisions were reported, cutting the rate of collision roughly in half.

Aurora Ave N Project Completion

The substantial completion of the Aurora Corridor was achieved in January 2015. An average of total collisions from 2003-2005 in comparison to 2014-2016 shows a decrease of 34%.



Even more notable is the reduction in Evident, Serious, and Fatal injury collisions which dropped by 50% for the same 2003-2005 versus 2014-2016 comparison periods.



Volumes

Volumes on the Aurora Corridor have increased significantly since 2014, as the table below illustrates. This is an important consideration in signal timing and coordination, and is a factor to consider in the Travel Speed section that follows.

		Southbound	Northbound	Total	% Change
2014	Average Daily Weekday Traffic (AWDT)	16759	15326	32085	
	AM Peak Weekday Average	1379	662	2042	
	PM Peak Weekday Average	1053	1304	2357	
2016	Average Daily Weekday Traffic (AWDT)	19059	17438	36497	**14%**
	AM Peak Weekday Average	1585	609	2194	**7%**
	PM Peak Weekday Average	1137	1522	2659	**13%**

Travel Speed

A final signal retiming effort was completed in November of 2016. To compare before and after average travel speeds, travel time runs were logged from N 205th St to N 145th St. An averaged travel speed for 4 runs for both the before (2014) period and after (2016) periods were completed for comparison. The Highway Capacity Manual uses average travel speed to determine the Level of Service for Urban Street Segments which is also provided in the table below. Notably, the Aurora Corridor is operating within an acceptable average travel speed and associated Urban Street Level of Service standard. The AM

comparisons show a slight improvement in average travel speed while the PM peak travel speed is slightly lower. Given the significant volume increase, this indicates the retiming effort has been very successful in efficiently moving additional traffic through the corridor.

		Average Travel Speed (MPH)	Level of Service
AM Peak	Before	21.8	C
	After	24.5	C
PM Peak	Before*	20.5	D
	After	19.9	D

**Only 2 data sets available for PM Peak "Before" period.*

Transit Travel Time Benefits: Transit Signal Priority Activation

King County Metro provided the following summaries of Transit Signal Priority (TSP) benefits implemented with Aurora 3B signal timing improvements. The major time savings is at the intersection of Aurora and 200th, where TSP provides a 34 to 57 second savings on average. The intersection at the Transit Center entrance operated at a high Level of Service before TSP installation, so only minor benefits are seen with implementation.

Aurora Ave N & N 200th St – Westbound Left Turn		
Time of Day	**Time Savings (seconds)**	**% Change from no TSP**
AM	34.5	41.32
MD	38.5	39.90
PM	57	42.86

N 200th Street & Aurora Village – Eastbound Left Turn		
Time of Day	**Time Savings (seconds)**	**% Change from no TSP**
AM	2	6.06
MD	4	11.43
PM	-2	-5.13

Detection

Signal detection is a critical component of effective and efficient signal operation and coordination. As part of the signal retiming effort, signal detection was inspected and 37 failures were identified, the majority of which were resolved through the project. The remaining unresolved issues will be corrected through ongoing maintenance efforts. Additionally, 4 malfunctioning pedestrian pushbuttons were replaced, and 6 additional accessible pedestrian units installed.

Traffic Speed Summary

The City of Shoreline Traffic Services and Police departments have been working together to identify and target speed enforcement. Speed data is collected throughout the year and compared to the posted speed limit in order to identify streets where speeding is a problem.

Appendix F is the Traffic Speed Differential Map which shows the difference between the measured 85th percentile speed and the posted speed limit. Shoreline Police will use this data in 2017 to target streets with measured speeding problems.

In addition, Traffic Services will continue to rotate radar speed trailers and radar speed carts to help with the driver education component of speed reduction on problem corridors.

In 2016, Shoreline Police issued 3520 traffic citations and 3969 warnings.

Traffic Volume Summary

Traffic volume data is regularly collected at eight (8) locations which include:

- Aurora Ave N south of N 175th St
- Meridian Ave N south of N 175th St
- NW Richmond Beach Rd east of 3rd Ave NW
- 5th Ave NE south of NE 175th St
- 15th Ave NE south of NE 172nd St
- 25th Ave NE south of NE 171st St
- NE 175th St west of 5th Ave NE
- NW 175th St west of 3rd Ave NW

Below is a summary of data collected at these locations. As shown in the table, average weekday daily traffic volumes are up from 2015 by 1.71%. AM peak volumes are up by 2.04% and the PM peak volumes are up by 2.02%.

	2012	2013	2014	2015	2016	5 Year Average
AM Peak Aggregate AAWDT	7064	7444	6169	6399	6528	6721
PM Peak Aggregate AAWDT	9314	9521	7722	8033	8197	8857
Daily Aggregate AAWDT	108025	111441	96972	99719	101426	103517

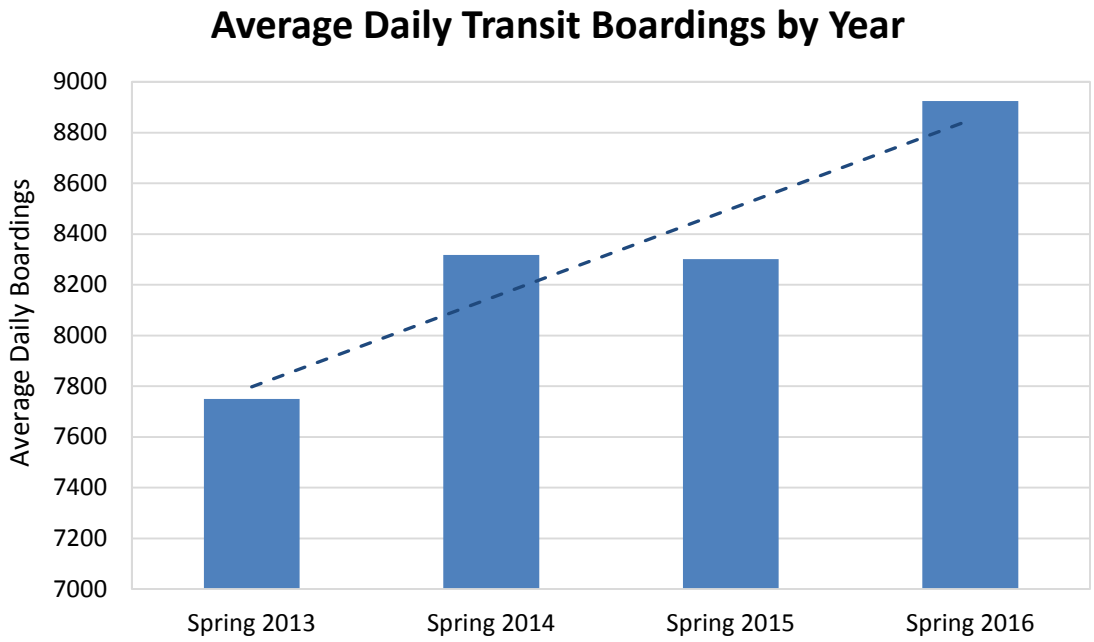
See Appendix E for the 2016 Traffic Flow Map which shows average daily weekday traffic volumes on additional City of Shoreline Streets.

Transit Summary

Transit ridership is up in Shoreline 7.5% compared to spring 2015, with 8925 average daily transit boardings. Ridership is up more than 15% since 2013.

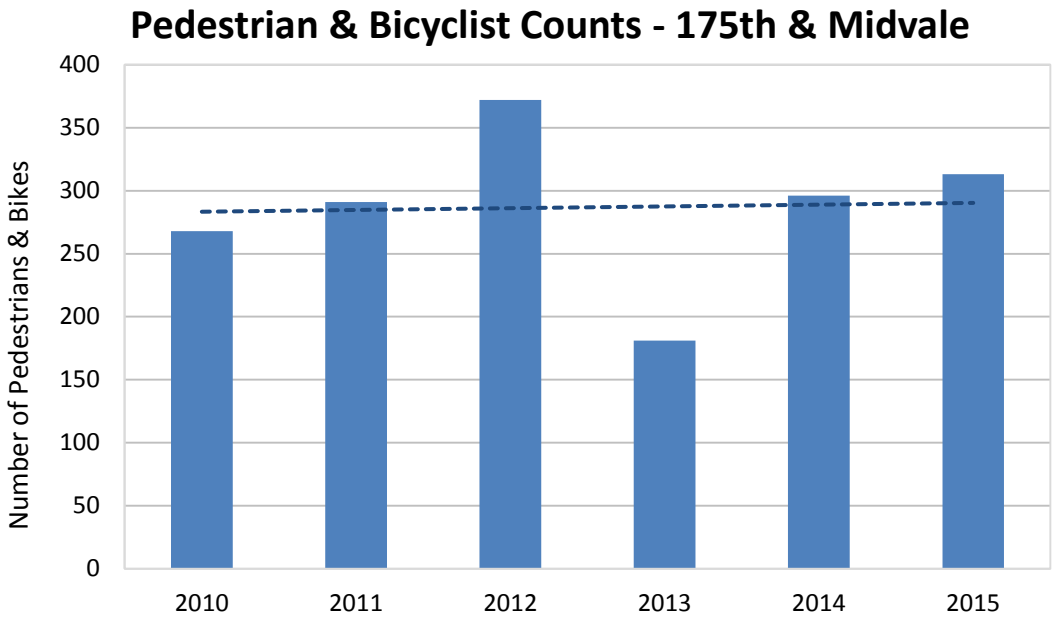
	Average Daily Transit Boardings in Shoreline	% Change
Spring 2016	8925	7.5%
Spring 2015	8301	-.2%
Spring 2014	8318	7.3%
Spring 2013	7750	-

**King County Metro data only*



Pedestrian and Bicycle Count Summary

The Washington State Documentation Project collects bicycle and pedestrian data in cities throughout the State. It occurs annually in the early fall. Pedestrian and bicyclist counts have been collected in Shoreline since 2010. The chart below summarizes 2 hours for both the AM and PM peak (4 hours total) for pedestrian and bicyclist counts at the intersection of N 175th Street and Midvale Ave N. Data is collected in fall each year so weather can be an influencing factor. The overall trend of nonmotorized activity at this location since 2010 is on the rise.



The table below from the State data provides the broader regional trend. The State's report shows an increase of 7% (combined bike and pedestrian) from 2011 to 2016.

	AM			PM			Total		
	2011	**2016**	**Difference**	**2011**	**2016**	**Difference**	**2011**	**2016**	**Difference**
Bike	4,103	4,981	21.4%	6,769	6,740	-0.4%	10,872	11,721	7.8%
Ped	7,674	8,717	13.6%	12,978	13,286	2.4%	20,652	22,003	6.5%
Total	11,777	13,698	16.3%	19,747	20,026	1.4%	31,524	33,724	7.0%

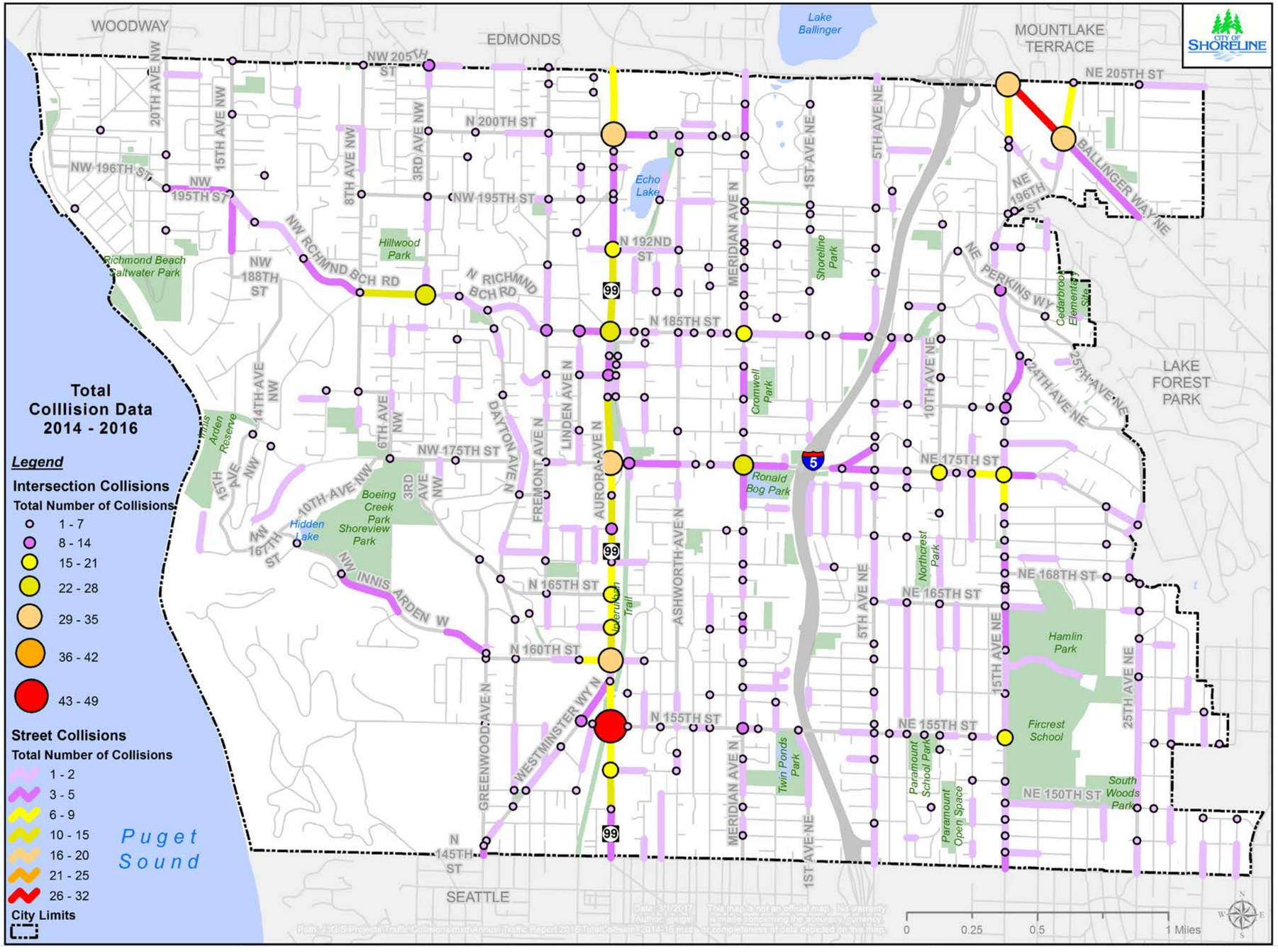
**Comparison based on 88 count locations statewide with comparable AM and PM data for 2011 and 2016.*

More information about this project can be found online at: http://www.wsdot.wa.gov/bike/Count.htm

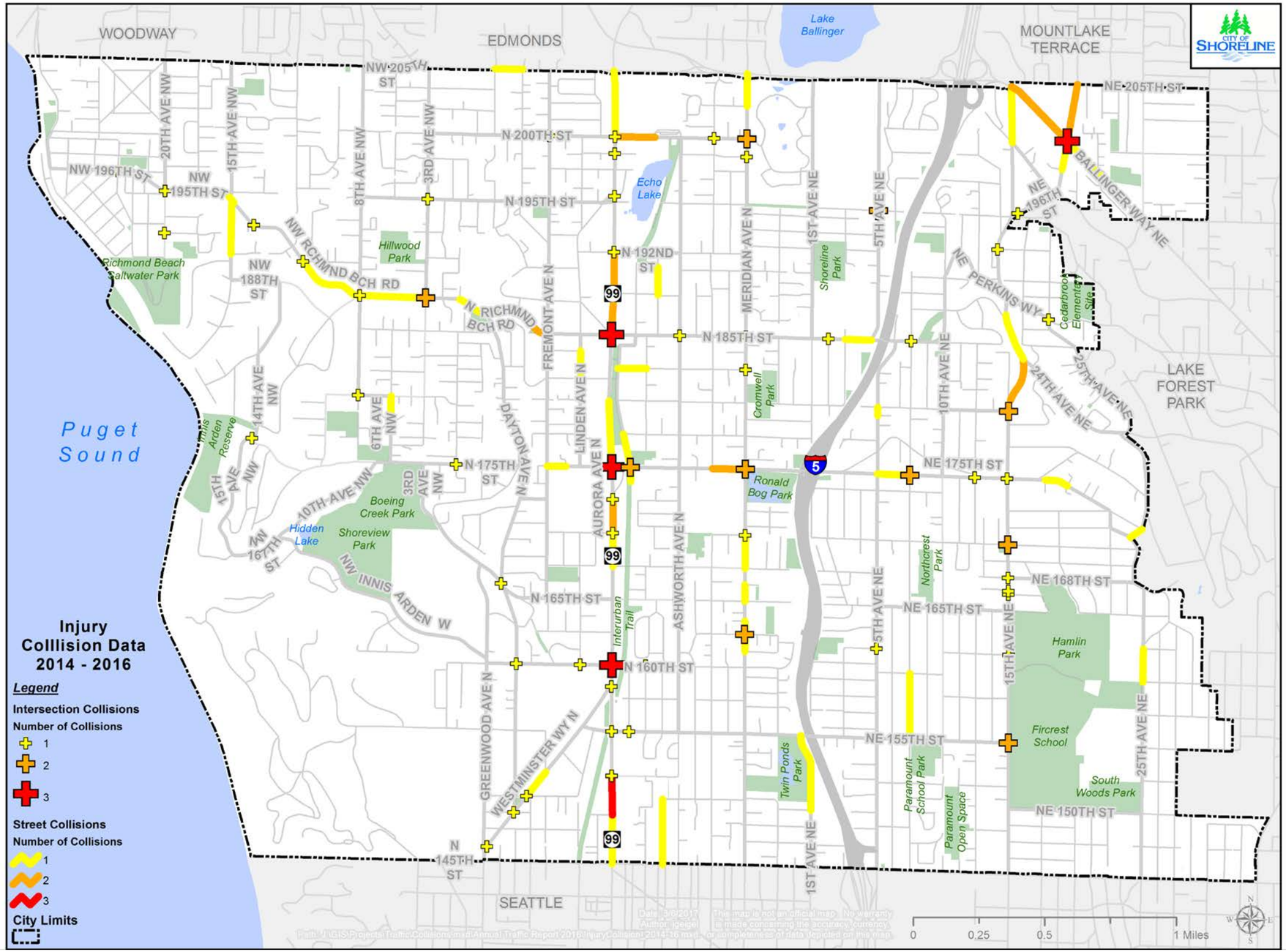
Appendix

Appendix A – 2014-2016 Total Collisions Map
Appendix B – 2014-2016 Injury Collisions Map
Appendix C – 2012-2016 Nonmotorized Collisions Map
Appendix D – 2014-2016 Fatal and Serious Injury Collisions Map
Appendix E – 2016 Traffic Flow Map
Appendix F – 2016 Speed Differential Map

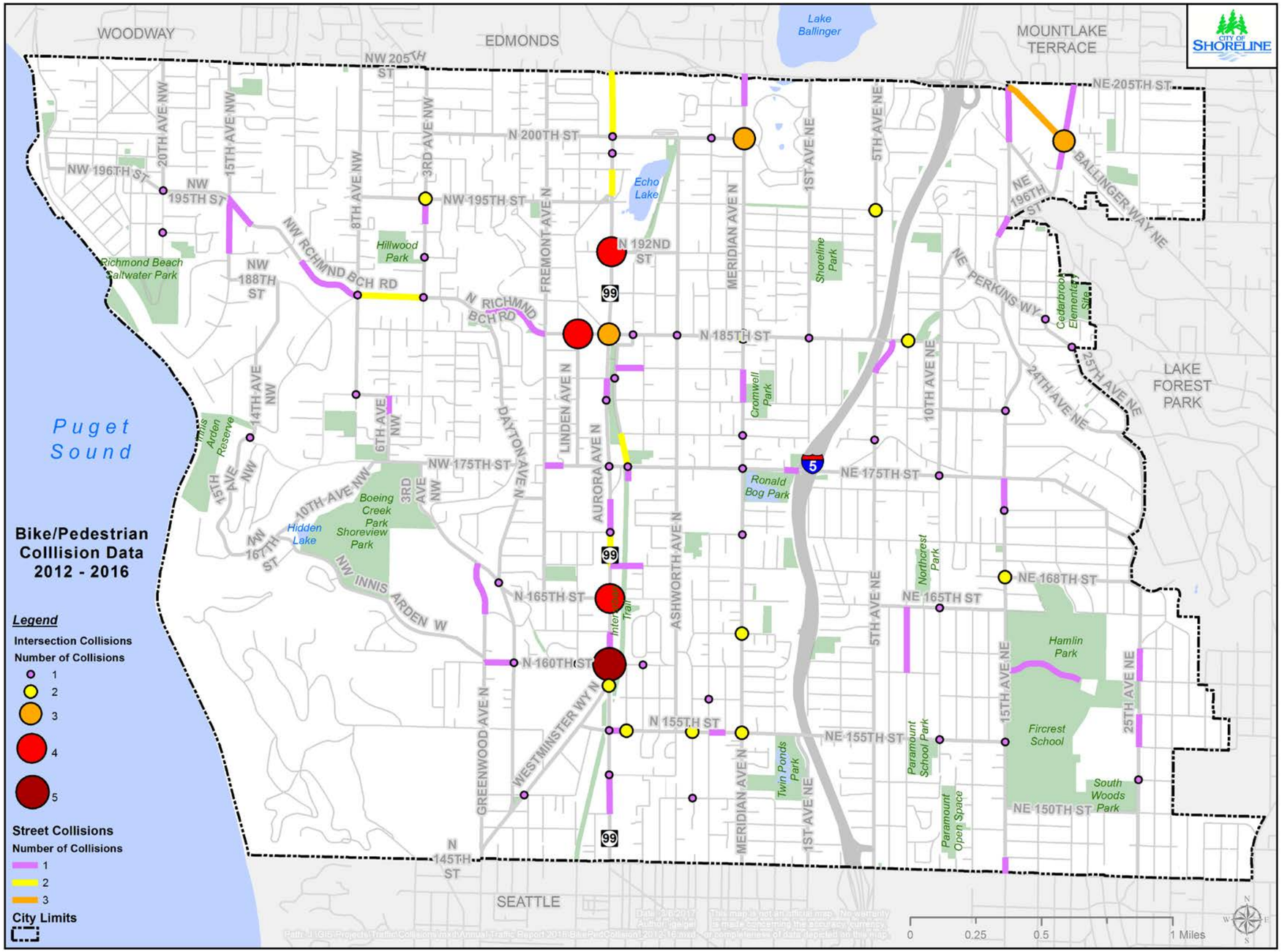
Appendix A – 2014-2016 Total Collisions Map



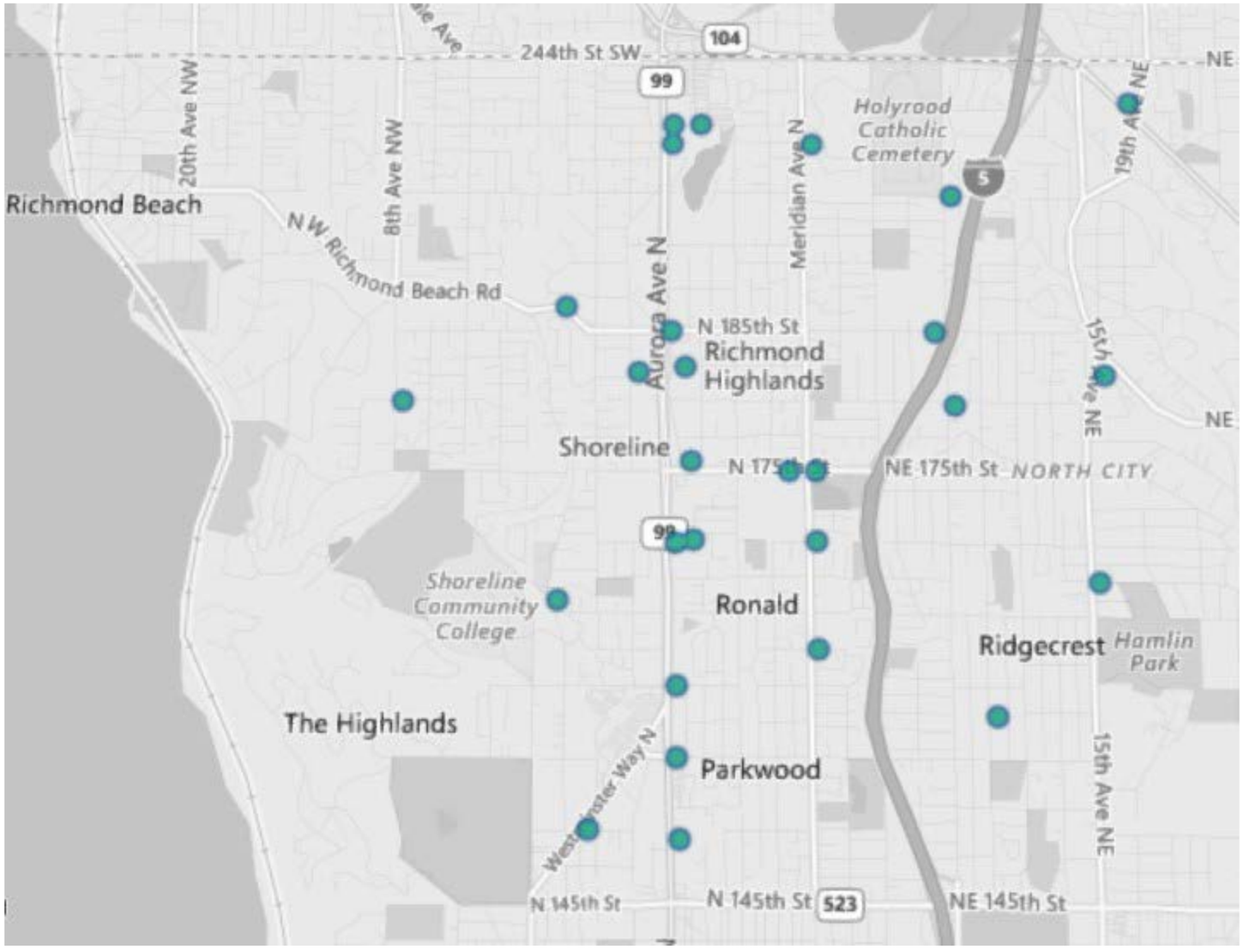
Appendix B – 2014-2016 Injury Collisions Map



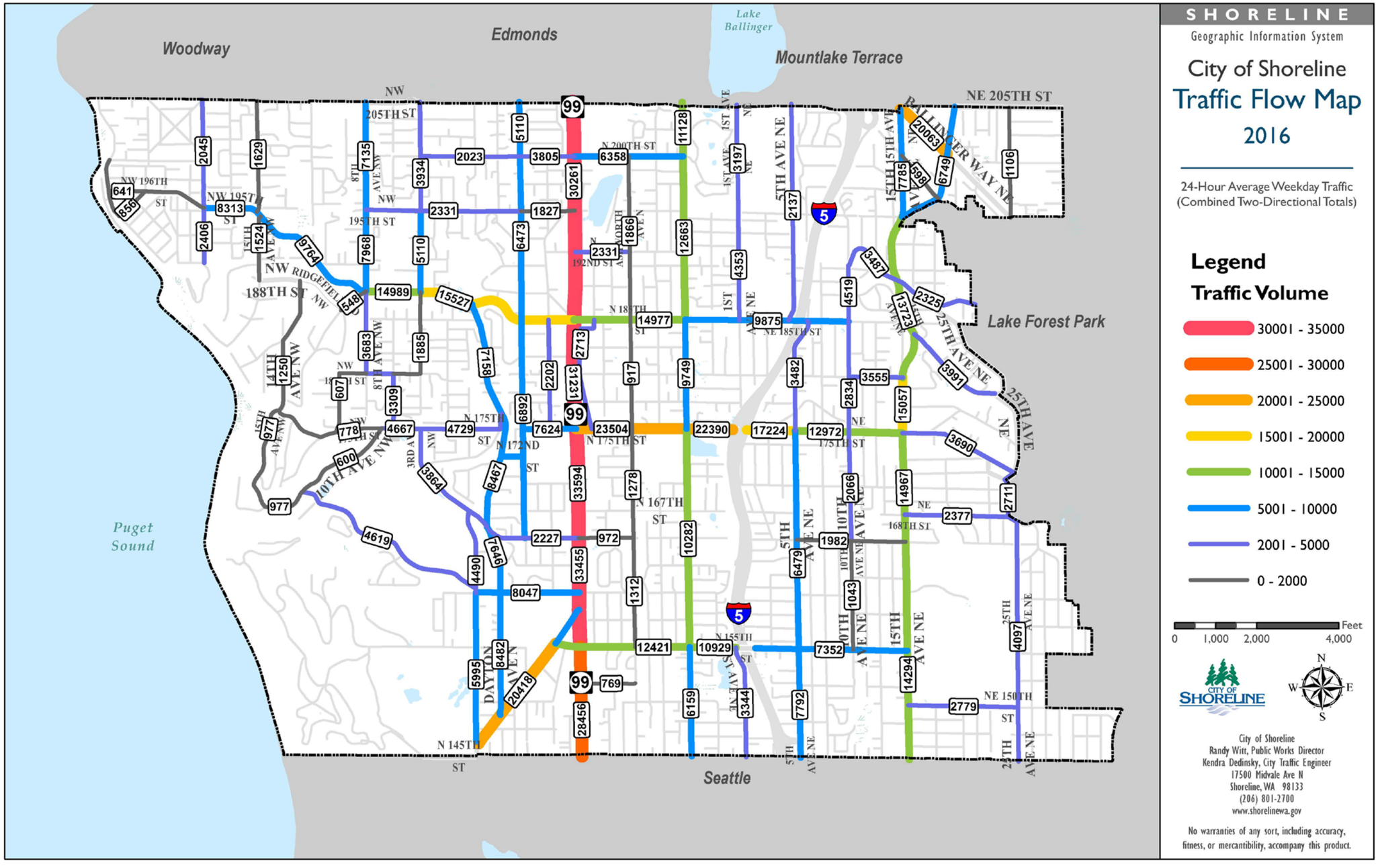
Appendix C – 2012-2016 Nonmotorized Collisions Map



Appendix D – 2014-2016 Fatal and Serious Injury Collisions Map



Appendix E – 2016 Traffic Flow Map



Appendix F – 2016 Speed Differential Map